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Review article

Modifiable Protective and Risk Factors for Depressive Symptoms among Older Community-dwelling Adults: A Systematic Review

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1. Introduction

Depression is a leading cause of disability worldwide and constitutes a primary contributor to the overall global burden of disease (World Health Organization [WHO], 2018). Depression is more common in later life, with an estimated prevalence among those aged 60 years and older of 7% for females and 5% for males, compared to 4% for females and 3% for males in the broader adult population (WHO, 2017). Many more people (including older adults) experience depressive symptoms that are not severe or persistent enough to merit a diagnosis, but are still associated with significant distress or impairment in important domains of daily functioning (Hjarsbech et al., 2011; Rowe & Rapaport, 2006; Strine et al., 2009). Furthermore, depressive symptoms often go undetected (Fiske, Wetherell, & Gatz, 2009), and this is especially the case among older adults due to the uncertainty about what constitutes depression in this cohort (Alexopoulos, 2005; Chapman & Perry, 2008; Chew-Graham et al., 2012; Rodda et al., 2011; Thomas & Shute, 2006). As the proportion of people aged 60 years and older is projected to increase from 13% in 2017 to 21% in 2050 (United Nations, 2017), it is likely that the number of older adults experiencing depressive symptoms will also increase substantially unless appropriate prevention strategies are developed and implemented.

Depressive symptoms can be especially debilitating for older adults. Compared to younger cohorts, older adults tend to have more limited social networks and suboptimal coping strategies (Fiske et al., 2009; Vink, Aartsen, & Schoevers, 2008; von Faber et al., 2016). In addition, the impact of depressive symptoms on daily functioning and well-being is greater among older adults, and can often result in direct medical costs and indirect economic costs due to reduced mobility (Bock et al., 2016; Donohue & Pincus, 2007). Preventing depressive symptoms in later life therefore has the potential to reduce the impact of these symptoms on both individuals and society.

Community-based interventions that focus on enhancing protective factors and minimizing risk factors have been identified as an important element of comprehensive approaches to the prevention of depressive symptoms among older people (WHO, 2012, 2018). Identifying the factors associated with depressive symptoms among older adults can assist in informing effective community-based programs aimed at preventing these symptoms. Three systematic reviews examining potential factors could be located (Cole & Dendukuri, 2003; Djernes, 2006; Vink et al., 2008), of which only one focused specifically on community-dwelling older adults (Cole & Dendukuri, 2003). The reviews had a degree of overlap, with 15 studies included in at least two reviews and three studies included in all three reviews. The majority of studies included in the reviews had longitudinal study designs and were primarily focused on non-modifiable factors, of which gender, functional impairment, and history of depression were typically found to be the most important (Cole & Dendukuri, 2003; Djernes, 2006; Vink et al., 2008). The most relevant modifiable factors were found to be low levels of social support, poor self-rated health, and sleep disturbance (Cole & Dendukuri, 2003; Djernes, 2006; Vink et al., 2008).

With the existence of cohort effects between different groups of seniors across time (Fozard & Wahl, 2012), current research on relevant protective and risk factors for depressive symptoms is needed to ensure intervention developers have access to up-to-date evidence to inform their efforts. It is particularly important to include modifiable factors in analyses to provide the information inputs required to develop interventions that can effectively target those variables that have the greatest potential to produce favorable change (Singh & Okereke, 2015). The present systematic review addressed these needs by synthesizing recent research on factors associated with depressive symptoms among older community-dwelling adults, with a particular focus on modifiable factors. Sociodemographic variables were also examined to enable the identification of specific groups of individuals within the broader older community-dwelling population who are most in need of intervention.

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2. Method

2.1. Search strategy

This review was conducted in accordance with the Preferred Reporting of Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff & Altman, 2009). As the most recent systematic review that could be located included studies up to December 2005 (Vink et al., 2008), a comprehensive search of the following databases was conducted for articles published from January 2006, with an end date of June 2018: Google Scholar, EBSCO, Medline, PubMed, ProQuest, PsychInfo, Science Direct, SCOPUS, Web of Science, and Wiley Online. The search terms were (risk factors OR protective factors OR predictors OR correlates OR association) AND (depressi* OR senile depression OR late*-life depression) AND (older people OR older adult OR elderly people OR late* life OR geriatric OR senior*) AND (community OR community-dwelling OR community population OR community sample OR independently living).

2.2. Selection criteria

Inclusion criteria for the studies were as follows: available in full-text; published in English; published between January 2006 and June 2018; methodology was either quantitative or mixed-method; participants were aged 60 years or older; participants were living in the community; the range of constructs examined as potential protective or risk factors for depression included at least one psychosocial, behavioral, or socio-demographic factor; multivariate analysis methods were employed; depressive symptoms were an outcome variable; and cut-off scores (if used) were equal to or above the validated cut-off score for clinically relevant depressive symptoms. For studies that were longitudinal in design, only those that controlled for pre-existing depressive symptoms in analyses or excluded participants who were identified as being depressed at baseline were reviewed.

2.3. Search process

The PRISMA flow diagram shown in Figure 1 summarizes the step-by-step process of selecting studies. The search initially returned 1,869 studies, with 1,167 remaining after the removal of duplicates. All study titles, abstracts, and full-texts were screened for relevance by the first author, and 10% of the studies at each step were reviewed by the third author. Disagreements about which studies should be included were discussed and resolved before moving on to the next step. This process resulted in 75 studies that were eligible to be included in the final review (references presented in the appendix).

2.4. Quality assessment

The methodological quality of each included study was determined using the QualSyst assessment tool (Kmet, Robert, & Cook, 2004). Quality was assessed against 14 criteria by the first and third authors, with discrepancies discussed until consensus was reached. Each study was given a score for each criterion (0 = no, 1 = partial, 2 = yes), with a 'not applicable' (N/A) option also available. An overall quality assessment score was calculated by summing all scores given for each criterion (excluding N/A scores), with higher scores indicating greater methodological rigor (adjusting for number of applicable criteria). The overall score is presented as a percentage, which indicates quality grade: <50% low; ≥50 and <70% medium; and ≥70% high (Kmet et al., 2004).

2.5. Data extraction

Across studies, there was considerable heterogeneity in terms of the age of the sample, the statistical methods used, and the independent and confounding variables included in analyses. As such, a formal statistical pooling of results was not attempted. Instead, a descriptive, narrative review of the data and tabulation of the study characteristics and main findings were undertaken. Factors were identified as risk or protective factors where there was a clear majority of studies supporting the finding.

3. Results

3.1. Study and participant characteristics

The characteristics of the 75 studies included in the review are described in Table 1. Across the studies there were 205,590 participants (baseline age ranged from 60 to 105 years), with sample sizes ranging from 108 to 37,193 (mean = 2,741; median = 1,253). The majority of studies included both females and males, with four studies comprising only males. The studies varied in terms of cultural setting: 23% (n = 17) were conducted in the United States, 16% (n = 12) in China, 15% (n = 11) in Japan, and 11% (n = 8) in Europe. The remaining studies were set in various other countries around the world (e.g., Australia and Thailand).

3.2. Methodological quality

The quality assessment criteria were applied to each of the 75 studies (scores shown in Table 1). Almost all reviewed studies were assessed to be of high quality, with 74 studies meeting ≥70% of the eligible criteria. The remaining study was identified as medium quality, meeting between ≥50% and <70% of the eligible criteria. Methodological strengths of studies included study objectives described sufficiently, appropriate variance estimates provided, and results described in sufficient detail. Methodological weaknesses of studies included method of participant selection not described sufficiently, participant characteristics not described in sufficient detail, and confounding variables not controlled for in analyses.

Two-thirds (64%) of the studies were cross-sectional and the remainder were longitudinal. The majority of studies (93%) used self-report measures to assess depressive symptoms, of which approximately half (57%) used the Geriatric Depression Scale (GDS) and one-fifth (21%) used the Center for Epidemiological Studies Depression scale (CESD).

3.3. Identified protective and risk factors

Modifiable and non-modifiable variables assessed in the eligible studies were categorized as potential risk or protective factors for depressive symptoms. Only factors that were reported in at least three studies are discussed and presented in Tables 2 to 4. This threshold was selected to enable comparisons among results. Factors examined by fewer than three studies are listed in Table S1 in the supplementary materials.

In total, 21 potential protective and risk factors were identified. These were categorized as psychosocial (social/family support, self-rated health, social network size, loneliness, sense of personal mastery), behavioral (physical activity, social participation, engagement in hobbies, use of modern devices, sleep disturbance, diet quality, smoking status, alcohol use), or sociodemographic (age, gender, education level, marital status, living situation, body mass index [BMI], socioeconomic status [SES], employment status).

Tables 2, 3, and 4 present findings from multivariate analyses relating to each of these factors. The majority of studies reported at least one significant association between a protective (60 studies) or risk (39 studies) factor and depressive symptoms among older community-dwelling adults. Very few studies assessed interaction effects, of which the majority examined potential moderating effects of socio-demographic variables. The results of these interactions are presented

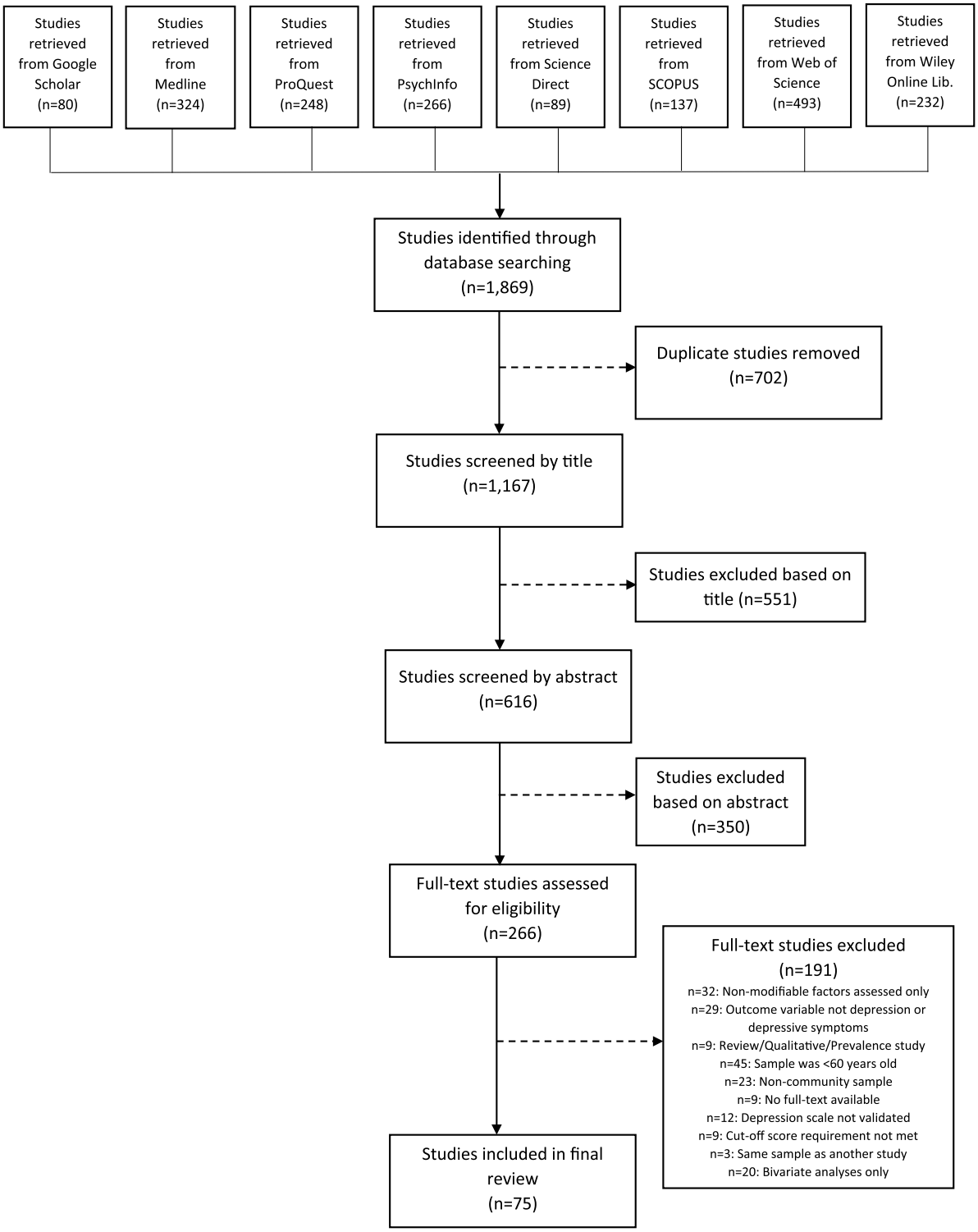

Figure 1. PRISMA flow diagram: Selection of studies

in Table S2 in the supplementary materials, along with the relevant independent and confounding variables for each included study.

3.3.1. *Psychosocial factors*

The relationships between psychosocial factors and depressive symptoms were explored in 45 studies (see Table 2). There was substantial evidence for the protective role of good social and/or family support and better self-rated health, with findings consistent across cross-sectional and longitudinal studies. Fewer studies examined sense of personal mastery as a potential protective factor, however the available evidence indicated a protective effect across both cross-sectional and longitudinal studies. Loneliness was only examined in cross-sectional studies, all but one of which found it to be an important risk factor for depressive symptoms. There were varied results within and between cross-sectional and longitudinal studies on the effect of larger social networks.

Table 1
Assessed studies investigating protective and risk factors for depressive symptoms among community-dwelling older adults.

Studies	Country	Methodology	Sample Size			Age (years)		Criteria for depression		Depressed participants N (%)	Factors studied	Quality assessment total (%)
			Baseline	Follow-up	% Female	Range	Mean	Measure	Cut-off score			
Abe et al., 2012	Japan	Cross-sectional	2,152	-	46	65+	76.7	GDS-15	≥6	570 (26)	Psychosocial Behavioral Sociodemographic	82
Aihara et al., 2011	Japan	Cross-sectional	887	-	53	65+	75.4	GDS-5	≥2	114 (13)	Behavioral	64
Alexandrino-Silva et al., 2011	Brazil	Cross-sectional	367	-	65	60+	70.1	CIDI	Meets diagnostic criteria	69 (19)	Psychosocial	73
Almeida et al., 2011	Australia	Longitudinal	12,203	5,127	-	65-85	-	ICD-9 & ICD-10	Meets diagnostic criteria	128	Behavioral	91
Almeida et al., 2014	Australia	Longitudinal	3,873	-	-	65-83	-	GDS-15	≥7	610	Behavioral Sociodemographic	95
Ang and Malhotra, 2016	Singapore	Cross-sectional	2,766	-	53	-	-	CESD-11	-	-	Psychosocial	91
Baiyewu et al., 2015	Africa (Nigeria)	Cross-sectional	458	-	57	-	73.7	GDS-30	≥11	59 (13)	Psychosocial Behavioral	77
Brinda et al., 2016	Multiple Countries	Cross-sectional	14,877	-	55	65+	-	ICD-10	Meets diagnostic criteria	700 (5)	Psychosocial Sociodemographic	95
Cao et al., 2016	China	Cross-sectional	1,168	-	52	60-94	70.7	GDS-30	≥11	305 (26)	Psychosocial	100
Carayanni et al., 2012	Europe (Greece)	Cross-sectional	360	-	61	60+	-	GDS-15	≥6	109 (30)	Behavioral Sociodemographic	95
Carriere et al., 2017	Europe (France)	Longitudinal	1,253	-	59	68-76	-	CESD-20	≥16	342	Sociodemographic	100
Castro-Costa et al., 2008	Africa (Cameroon)	Cross-sectional	1,510	-	61	-	-	GHQ-12	≥5	582 (39)	Psychosocial Behavioral Sociodemographic	91
Chan and Zeng, 2009	China	Cross-sectional	1,042	-	100	60+	71.4±7.4	GDS-15	≥8	124 (12)	Psychosocial	86
Chan et al., 2011	Singapore	Cross-sectional	4,489	-	54	60-97	69.3±7.2	CESD-11	-	-	Psychosocial Behavioral Sociodemographic	100
Chan et al., 2012	China	Longitudinal	4,000	2,630	40	65+	71.7±4.7	GDS-15	≥8	192 (baseline) 105 (follow-up)	Psychosocial Behavioral Sociodemographic	100
Chan et al., 2014	China	Cross-sectional & Longitudinal	2,902	2,211	40	65+	71.8±4.8	GDS-15	≥8	218	Behavioral	95
Chang et al., 2017	China (Taiwan)	Longitudinal	2,673	1,361	45	65+	74.2±5.7	CESD-10	≥10	624	Psychosocial Behavioral	100
Chao et al., 2018	USA	Cross-sectional	3,157	-	59	60-105	72.8±8.3	PHQ-9	≥10	256	Psychosocial Sociodemographic	95
Cho et al., 2018	South Korea	Cross-sectional	10,197	-	57	60+	70.2±6.6	GDS-15	≥8	2,391 (23)	Behavioral Sociodemographic	91
Choi and McDougall, 2009	USA	Cross-sectional	211	-	81	60-96	-	GDS-15	≥5	51 (24)	Psychosocial Sociodemographic	100
Choi et al., 2013	Europe	Cross-sectional	7,238	-	48	60-99	68.7±6.8	EUROD-12	≥4	765 (11)	Sociodemographic	95
Elliot et al., 2014	USA	Cross-sectional	6,483	-	57	65+	-	PHQ-9 item	-	-	Behavioral Sociodemographic	100
Fukunaga et al., 2012	Japan	Cross-sectional	964	-	62	65+	-	GDS-15 item	≥6	199 (21)	Psychosocial Behavioral Sociodemographic	82
Garcia-Pena et al., 2013	Mexico	Longitudinal	2,949	2,352	61	60+	70.9	GDS-30 item	≥11	-	Psychosocial Behavioral Sociodemographic	95
Giltay et al., 2006	Europe (Netherlands)	Longitudinal	464	135	-	64-84	70.8	Zung SDS	≥50	202	Psychosocial	91
Glass et al., 2006	USA	Cross-sectional & Longitudinal	2,812	1,970	61	65+	-	CESD-20	≥16	-	Behavioral Sociodemographic	100
Gomes et al., 2018	Brazil	Cross-sectional	1,378	-	63	60+	-	GDS-10	≥5	(15)	Behavioral	95
Gong et al., 2018	China	Cross-sectional	3,182	-	59	60-95	70.7±6.9	GDS-15	≥6	640 (21)	Psychosocial Behavioral Sociodemographic	86
Han et al., 2007	South Korea	Cross-sectional	205	-	63	60+	-	KDSKA-25	-	-	Psychosocial Sociodemographic	95
Hua et al., 2015	China	Cross-sectional	954	-	63	60+	70.9±7.2	GDS-30	≥11	151 (16)	Behavioral	77

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Table 1 (*continued*)

Studies	Country	Methodology	Sample Size		% Female	Age (years)		Criteria for depression		Depressed participants N (%)	Factors studied	Quality assessment total (%)
			Baseline	Follow-up		Range	Mean	Measure	Cut-off score			
Isaac et al., 2009	Europe (France)	Longitudinal	1,849	463	58	65+	73.2	CESD-20	≥15/16	564 (31)	Behavioral	100
Jaussent et al., 2011	Europe (France)	Longitudinal	9,077	3,824	56	65+	-	Modified CESD-20	≥16	618 (16)	Behavioral	95
Jeon and Dunkle, 2009	USA	Longitudinal	193	155	80	85+	87.7	SCL-90 Depression Scale	-	-	Psychosocial	86
Kaneko et al., 2007	Japan	Cross-sectional	1,925	-	57	60+	70.7 ± 7.0	Zung SDS	≥50	201 (10)	Psychosocial Sociodemographic	77
Khaltar et al., 2017	Sri Lanka	Cross-sectional	778	-	61	60+	-	GDS-15	≥6	236 (30)	Psychosocial Sociodemographic	95
Ku et al., 2018	China (Taiwan)	Longitudinal	285	274	54	65+	74.5 ± 6 .1	GDS-15	≥5	274 (100)	Behavioral	91
Kuchibhatla et al., 2012	USA	Longitudinal	3,973	1,516	65	65-105	-	CESD-20	≥16	930	Psychosocial Sociodemographic	100
Kuroda et al., 2015	Japan	Cross-sectional	1,856	-	50	65-94	72.9 ± 5.5	GDS-15	≥6	272 (15)	Psychosocial Behavioral Sociodemographic	95
Lee, C et al., 2012	China (Taiwan)	Longitudinal	2,432	1,481	46	65+	73.4	CESD-10	≥10	312 (21)	Psychosocial Behavioral Sociodemographic	100
Lee, L et al., 2012	Malaysia	Cross-sectional	318	-	59	60+	-	GDS-15	≥5	96 (30)	Behavioral Sociodemographic	100
Lee et al., 2013	USA	Longitudinal	419	382	55	60-95	68.5	SCID & HAMD-24	Meets diagnostic criteria	68 (16)	Behavioral Sociodemographic	95
Lee et al., 2014	USA	Cross-sectional	810	-	55	60+	70.4	PHQ-9	≥10	32 (4)	Behavioral Sociodemographic	100
Li et al., 2011	China	Cross-sectional	2,002	-	49	60+	-	GDS-15	≥8	250 (13)	Psychosocial Behavioral	95
Li et al., 2015	Singapore	Cross-sectional	162	-	76	65+	72.2 ± 6.2	GDS-15	≥5	56 (35)	Psychosocial Sociodemographic	86
Lin et al., 2014	USA	Cross-sectional	108	-	56	60-94	70.6 ± 7.7	GDS-15	≥5	? (11)	Psychosocial Sociodemographic	95
Lue et al., 2010	China (Taiwan)	Longitudinal	1,868	1,487	42	65+	-	CESD-10	≥10	293	Psychosocial Sociodemographic	100
Maglione et al., 2014a	USA	Longitudinal	1,966	952	100	70-100	84.2	GDS-15	≥6	46 (5)	Behavioral	100
Maglione et al., 2014b	USA	Cross-sectional	3,020	-	100	70-100	-	GDS-15	≥6	355 (12)	Behavioral	100
Morikawa et al., 2013	Japan	Cross-sectional	3,796	-	50	65-93	72.2 ± 5.1	GDS-15	≥6	561 (15)	Psychosocial Behavioral Sociodemographic	100
Murata et al., 2008	Japan	Cross-sectional	29,860	-	54	65+	-	GDS-15	≥5	9,834 (33)	Psychosocial Sociodemographic	95
Nakulan et al., 2015	India	Cross-sectional	220	-	58	65+	-	ICD-10	Meets diagnostic criteria	86 (39)	Psychosocial Sociodemographic	86
Nicolosi et al., 2011	Brazil	Cross-sectional	303	-	65	65+	71.8 ± 5.4	GDS-15	≥5	63 (21)	Psychosocial Sociodemographic	100
Park et al., 2015	South Korea	Longitudinal	701	340	48	65+	71.3 ± 4.9	GDS-15	≥8	104	Behavioral	100
Park, 2017	South Korea	Longitudinal	2,435	-	100	65-104	-	CESD-11	-	-	Psychosocial Behavioral	100
Park et al., 2017	South Korea	Cross-sectional	258	-	52	65+	74.7	GDS-30	≥10	44 (17)	Psychosocial Sociodemographic	100
Piboon et al., 2012	Thailand	Cross-sectional	317	-	60	60-97	70.4 ± 7.66	GDS-30	-	-	Psychosocial Sociodemographic	95
Pilania et al., 2017	India	Cross-sectional	500	-	54	60+	68.5 ± 7.7	GDS-30	≥22	72 (14)	Behavioral Sociodemographic	95
Richardson et al., 2012	USA	Cross-sectional	378	-	69	-	-	SCID & PHQ-9	Meets diagnostic criteria / ≥10	101 (27)	Psychosocial	100
Russell and Taylor, 2009	USA	Cross-sectional	947	-	55	-	-	CESD-20	-	-	Psychosocial Sociodemographic	86

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Table 1 (*continued*)

Studies	Country	Methodology	Sample Size		% Female	Age (years)		Criteria for depression		Depressed participants N (%)	Factors studied	Quality assessment total (%)
			Baseline	Follow-up		Range	Mean	Measure	Cut-off score			
Sachs-Ericsson et al., 2007	USA	Longitudinal	4,162	2,406	63	65+	72±5.7	CESD-20	-	-	Psychosocial Sociodemographic	95
Schwarzbach et al., 2013	Europe (Germany)	Cross-sectional	1,028	-	67	75+	-	GDS-15	≥6	99 (10)	Behavioral Sociodemographic	100
Shin et al., 2008	South Korea	Longitudinal	1,000	787	53	65+	75.4	DSM-IV	Meets diagnostic criteria	65 (16)	Psychosocial	95
Smagula et al., 2015	USA	Cross-sectional & Longitudinal	2,892	2,124	-	65+	76.2±5.5	GDS-15	≥6	177	Behavioral	91
St John et al., 2006	Canada	Cross-sectional	1,382	-	60	65+	75.3	CESD-20	≥16	159 (12)	Psychosocial Sociodemographic	95
Sun et al., 2012	USA	Longitudinal	1,000	624	53	60+	74.9±5.9	GDS-15	≥6	(7)	Psychosocial Sociodemographic	91
Tani et al., 2015	Japan	Longitudinal	77,714	37,193	53	65+	-	GDS-15 item	≥5	4373	Psychosocial Behavioral Sociodemographic	91
Tanner et al., 2014	USA	Cross-sectional	533	-	76	60-100	78.5±8.8	GDS-15 item	>5	186 (35)	Psychosocial Sociodemographic	91
Thirthahalli et al., 2014	India	Cross-sectional	473	-	71	60+	68.7±6.7	CESD-20 item	≥16	179 (38)	Behavioral Sociodemographic	95
Uemura et al., 2017	Japan	Longitudinal	5,104	3,106	49	65+	71.5±5.2	GDS-15 item	≥6	239	Behavioral	91
Vanoh et al., 2016	Malaysia	Cross-sectional	2,264	-	52	60+	-	GDS-15 item	≥5	373 (17)	Psychosocial Behavioral Sociodemographic	95
van't Veer-Tazelaar et al., 2008	Europe (Netherlands)	Cross-sectional	2,850	-	62	75-99	-	CESD-20 item	≥16	887 (31)	Sociodemographic	100
Woo et al., 2006	China	Cross-sectional	3,394	-	44	65+	72 ±4.9	GDS-15 item	≥8	280 (8)	Behavioral	100
Yoo et al., 2016	South Korea	Cross-sectional	648	-	70	65+	75.4 ±5.9	GDS-15 item	-	-	Psychosocial Sociodemographic	100
Yoshida et al., 2015	Japan	Longitudinal	1,327	680	57	65+	72.7±5.4	GDS-15 item	≥6	115	Behavioral	91
Yoshimura et al., 2013	Japan	Cross-sectional	274	-	68	65+	74.3±4.7	GDS-15 item	≥5	59 (22)	Sociodemographic	100

Note: CESD = Center for Epidemiological Studies Depression scale; CIDI = Composite International Diagnostic Interview; DSM = Diagnostic and Statistical Manual of Mental Disorders; GDS = Geriatric Depression Scale; GHQ = General Health Questionnaire; HADS = Hospital Anxiety and Depression Scale; HAMD = Hamilton Depression Rating Scale; ICD = International Classification of Diseases; KDSKA = Kim Depression Scale for Korean Americans; PHQ = Patient Health Questionnaire; SCID = Structured Clinical Interview for DSM; SCL = Symptom Checklist; Zung SDS = Zung Self-Rating Depression Scale.

Table 2
Relationships between psychosocial factors and depressive symptoms among community-dwelling older adults.

Study	Good social/family support n = 36	Better self-rated health n = 16	Loneliness n = 5	Large social network n = 5	Sense of personal mastery n = 3
Abe et al., 2012	-				
Alexandrino-Silva et al., 2011	-				
Ang and Malhotra, 2016	-				-
Baiyewu et al., 2015		-			
Brinda et al., 2016	0				
Cao et al., 2016	0	-			
Castro-Costa et al., 2008		-			
Chan et al., 2011	-				
Chan et al., 2012	0				
Chan and Zeng, 2009	-	-			
Chang et al., 2017	-	-			
Chao et al., 2018	-				
Choi and McDougall, 2009	-				
Fukunaga et al., 2012	-				
Garcia-Pena et al., 2013	0			0	
Giltay et al., 2006		-			
Gong et al., 2018	-				
Han et al., 2007	-	-		0	
Jeon and Dunkle, 2009	-				-
Kaneko et al., 2007	-	-	+		
Khaltar et al., 2017	-				
Kuchibhatla et al., 2012	-	-		-	
Kuroda et al., 2015	-			-	
Lee, C et al., 2012	0				
Li et al., 2011		-			
Li et al., 2015	-		+		
Lin et al., 2014				0	-
Lue et al., 2010	0				
Morikawa et al., 2013	-				
Murata et al., 2008		-			
Nakulan et al., 2015	-				
Nicolosi et al., 2011		-			
Park, 2017	-				
Park et al., 2017	-				
Piboon et al., 2012	-		+		
Richardson et al., 2012	-				
Russell and Taylor, 2009	-				
Sachs-Ericsson et al., 2007		-			
Shin et al., 2008	-				
St John et al., 2006		-			
Sun et al., 2012	-	-			
Tani et al., 2015	-				
Tanner et al., 2014	-		+		
Vanoh et al., 2016	0		0		
Yoo et al., 2016	-	-			

Note: n = number of studies examining this factor. A plus sign (+) indicates a risk factor, a minus sign (-) indicates a protective factor, zero (0) indicates a non-significant association, and a blank cell indicates the factor was not examined. *Italics* indicates longitudinal studies. Studies that did not examine psychosocial factors are not included in this table.

3.3.2. Behavioral factors

The relationships between behavioral factors and depressive symptoms were explored in 42 studies (see Table 3). Strong support across cross-sectional and longitudinal studies was found for physical activity, greater social participation, engagement in hobbies, and good diet quality being significant protective factors, and sleep disturbance being a significant risk factor. The majority of studies examining past/current smoking and alcohol use did not find these behaviors to be significant risk factors for depressive symptoms. Research examining the use of modern devices was limited and results were varied.

3.3.3. Sociodemographic factors

The relationships between sociodemographic factors and depressive symptoms were explored in 48 studies (see Table 4). The majority of studies examining age, gender, marital status, living arrangement, employment status, and weight status did not find a significant relationship between these factors and depressive symptoms. Results relating to lower education level and SES were mixed. Half of the studies examining these factors found them to be risk factors for depressive symptoms, while the other half did not find significant relationships.

4. Discussion

This systematic review assessed 75 studies examining various modifiable and non-modifiable factors associated with depressive symptoms among older community-dwelling adults. All but one of the studies were deemed to be of high quality, and the mean quality score was 0.94. Of the 21 factors identified in this review, good social/family support, better self-rated health, engagement in physical activity, and participation in social activities were identified as key protective factors, while sleep disturbance was identified as an important risk factor (see Table 5). These results are consistent with those of previous reviews (Cole & Dendukuri, 2003; Djernes, 2006; Vink et al., 2008), indicating that these factors should be focal issues in efforts to improve the well-being of older people.

In contrast with previous reviews (Cole & Dendukuri, 2003; Djernes, 2006; Vink et al., 2008), the majority of studies examining sociodemographic factors did not find an association with depressive

Table 3
Relationships between behavioral factors and depressive symptoms among community-dwelling older adults.

Study	Physical activity n = 15	Greater social participation n = 12	Sleep disturbance n = 11	Alcohol use n = 10	Past or current smoker n = 8	Good diet quality n = 6	Engaged in hobbies n = 5	Use of modern devices n = 2
Abe et al., 2012			+					
Aihara et al., 2011	-	0		0	0	-	-	
Almeida et al., 2014				+	+			
Almeida et al., 2011			+					
Baiyewu et al., 2015		-						
Carayanni et al., 2012		-						
Castro-Costa et al., 2008			+					
Chan et al., 2011		-						
Chan et al., 2012				0			-	
Chan et al., 2014						-		
Chang et al., 2017	-							
Cho et al., 2018	-							
Elliot et al., 2014		-						0
Fukunaga et al., 2012			+	0	0	-		
Garcia-Pena et al., 2013	0			0	0			
Glass et al., 2006	-	-						
Gomes et al., 2018						-		
Gong et al., 2018			+					
Hua et al., 2015	-					-		
Isaac et al., 2009		-						
Jaussent et al., 2011			+					
Ku et al., 2018	-							
Kuroda et al., 2015		-						
Lee, C et al., 2012				0			-	
Lee, L et al., 2012	-	0						
Lee et al., 2013			+					
Lee et al., 2014	-							
Li et al., 2011				+				
Maglione et al., 2014a			0					
Maglione et al., 2014b			+					
Morikawa et al., 2013	-		+	+	0			
Park et al., 2015	-			0	0			
Park, 2017							-	
Pilania et al., 2017							-	
Smagula et al., 2015			+					
Schwarzbach et al., 2013		-						
Tani et al., 2015		-						
Thirthahalli et al., 2014					0			
Uemura et al., 2017	-	-						-
Vanoh et al., 2016	0							
Woo et al., 2006	0			0	+	-		
Yoshida et al., 2015	-							

Note: n = number of studies examining factor. A plus sign (+) indicates a risk factor, a minus sign (-) indicates a protective factor, a zero (0) indicates a non-significant association, and blank cell indicates the factor was not examined. *Italics* indicates longitudinal studies. Studies that did not examine behavioral factors are not included in this table.

symptoms. This variation in outcomes may be at least partially due to the relative importance of the other factors included in the multivariate analyses conducted in more recent studies. The lack of effect of these sociodemographic factors in the present review suggests that it may not be necessary to tailor mental well-being interventions according to characteristics such as age, gender, marital situation, and living arrangement, which potentially simplifies the task of intervention design and implementation by permitting a more broad-based approach.

Overall, the review results highlight the importance of interventions and prevention programs designed to achieve (i) increased social and/or family support, (ii) higher self-rated health, (iii) greater participation in physical and social activities, and (iv) improved sleep patterns. Evidence indicates that interventions focused on increasing social and/or physical activity are particularly effective in reducing depressive symptoms among older adults (Catalan-Matamoros, Gomez-Conesa, Stubbs, & Vancampfort, 2016; Forsman, Nordmyr, & Wahlbeck, 2011a; Forsman, Schierenbeck, & Wahlbeck, 2011b). This may be due to the ability of such interventions to address all four of the factors identified as being predictive of depressive symptoms in this review. For example, physical activity has been found to improve sleep quality (Reid et al., 2010; Singh et al., 2005), social activity has been linked with greater social support (Li, Jiang, Li, & Zhang, 2018), and both physical and social activities have been linked with positive changes in older adults' self-rated health (Fiorillo & Nappo, 2017; Ichida et al., 2013; Wanderley et al., 2011). Facilitating older adults' participation in such activities is therefore important to prevention efforts. This could be achieved by tailoring programs and activities to seniors' capabilities (e.g., access to transport, fitness levels) and preferences (e.g., activities the individual finds meaningful/interesting or that involve peers and family members) (Catalan-Matamoros et al., 2016; Forsman et al., 2011a, 2011b; Liljas et al., 2019). It is also important to ensure that such activities are affordable (Liljas et al., 2019).

Several new modifiable variables were included in this review: engagement in hobbies, diet quality, employment status, and use of modern devices. Of these, engagement in hobbies and good diet quality were found to be protective against depressive symptoms, while no

Table 4
Relationships between sociodemographic factors and depressive symptoms among community-dwelling older adults.

Study	Older n = 35	Female n = 30	Lower level of education n = 28	Not married n = 16	Living alone n = 11	Unemployed n = 5	Overweight/obese n = 4	Low SES n = 4
Abe et al., 2012	0	0			0	+		
Almeida et al., 2014	+							
Brinda et al., 2016	0	+	+					
Carayanni et al., 2012				+				+
Carriere et al., 2017	0						0	
Castro-Costa et al., 2008	+	+	+	+				
Chan et al., 2011	0		+		+			
Chan et al., 2012	0			0				
Chao et al., 2018	+	+	0	+	0			
Cho et al., 2018							0	
Choi et al., 2013						0		
Choi and McDougall, 2009	0	0	0		0			
Elliot et al., 2014	-							0
Fukunaga et al., 2012	+	0			0			
Garcia-Pena et al., 2013	+	0	+	0	0			
Gong et al., 2018	+		+					
Glass et al., 2006	0	+		+				
Han et al., 2007	0	0	+					
Kaneko et al., 2007	+							
Khaltar et al., 2017	0	0	0	0	0			+
Kuchibhatla et al., 2012	0	+	+					
Kuroda et al., 2015	+		0		+			
Lee, C et al., 2012			0			0		
Lee, L et al., 2012	0			0				
Lee et al., 2013	-	0	+	+				
Lee et al., 2014	+							
Li et al., 2015	0	0	0		0			
Lin et al., 2014	0	0	0	0				
Lue et al., 2010	0	+	0	0				
Morikawa et al., 2013	0	0	+					
Murata et al., 2008	-	0	0	+				
Nakulan et al., 2015		+						
Nicolosi et al., 2011			+					
Park et al., 2017			0					
Piboon et al., 2012		+						
Pilania et al., 2017		+						
Russell and Taylor, 2009	0	0		0	+			0
Sachs-Ericsson et al., 2007	0	0	+				+	
Schwarzbach et al., 2013	0	0	0					
St John et al., 2006	0	0	0		0			
Sun et al., 2012	0	0	+	0				
Tani et al., 2015				0		0		
Tanner et al., 2014		0						
Thirthahalli et al., 2014		+	0			0		
Vanoh et al., 2016			+					
van't Veer-Tazelaar et al., 2008	0	0	+	0				
Yoo et al., 2016	0	0	0					
Yoshimura et al., 2013	0	0					0	

Note: n = number of studies examining factor. A plus sign (+) indicates a risk factor, a minus sign (-) indicates a protective factor, a zero (0) indicates a non-significant association, and blank cell indicates the factor was not examined. *Italics* indicates longitudinal studies. Studies that did not examine sociodemographic factors are not included in this table.

significant relationship was found for employment status. The results for use of modern devices were inconclusive across studies. Given the recency of work in these areas, further research could assist in clarifying the role of these factors in influencing older people's likelihood of experiencing depressive symptoms.

The present review had several limitations that should be considered. First, it was confined to studies published in English. However, the included studies were undertaken in a wide range of countries, including those where other languages are dominant. Second, the factors addressed in the results represent variables examined by three or more studies, thus emerging and novel factors assessed by a smaller number of studies were not reviewed (but are listed in Table S1). Third, the included studies used a range of depression scales (e.g., GDS, CESD) and measurement approaches (e.g., cut-off vs continuous scores), limiting the comparability of results. Fourth, the included studies using multivariate analyses may not be directly comparable because varying adjustments were made for different variables, and it is possible that discrepancies relating to individual factors may be due to the nature and quantity of other variables included in the analyses.

Table 5
Systematic review outcome summary.

Protective Factors	Risk Factors	Inconclusive Factors	Unrelated Factors
Good social/family support^{+++}	Sleep disturbance^{+++}	Level of education^{+++}	Age^{+++}
Better self-rated health^{+++}	Loneliness^{+}	Alcohol use^{+++}	Gender^{+++}
Physical activity^{+}		Smoking status^{++}	Marital status^{+++}
Greater social participation +		Social network size^{+}	Living arrangement^{+++}
Good diet quality		SES^{+++}	Employment status
Engagement in hobbies		Use of modern devices	Weight status^{+}
Sense of personal mastery^{+}			

Note: Factors identified in this review are listed in descending order of importance in each column; Underline indicates factors that have not been examined by previous reviews; + indicates how many out of the three previous systematic reviews examined this factor.

5. Conclusion

Results of this and previous reviews highlight the complex nature of the etiology of depressive symptoms and the likely interrelationships between various psychosocial, behavioral, and sociodemographic factors. The important roles of social support and participation, better self-rated health, physical activity, and sleep quality in protecting against depressive symptoms among community-dwelling older adults were confirmed. This suggests that interventions that encourage social support, enhance self-rated health, include physical activity components, and/or improve sleep hygiene may have the potential to prevent or reduce depressive symptoms among community-dwelling older people.

Author Declaration Statement

We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

Contributors

Author CW conceptualized the study and took primary responsibility for preparing the manuscript. Author SP assisted with the design of the study, reviewing potential studies to include, assessing the quality of studies included, and manuscript preparation. Author MJ provided conceptual input for the study design and contributed to the preparation of the manuscript. The funder played no role in the conducting of the research or the reporting of the results.

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Declaration of Competing Interest

None.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2020.03.119.

Appendix

References of studies included in review

Abe, Y., Fujise, N., Fukunaga, R., Nakagawa, Y., & Ikeda, M. (2012). Comparisons of the prevalence of and risk factors for elderly depression between urban and rural populations in Japan. *International Psychogeriatrics; Cambridge, 24(8)*, 1235-1241. doi:10.1017/S1041610212000099

Aihara, Y., Minai, J., Aoyama, A., & Shimanouchi, S. (2011). Depressive symptoms and past lifestyle among Japanese elderly people. *Community Mental Health Journal, 47(2)*, 186-193. doi:10.1007/s10597-010-9317-1

Alexandrino-Silva, C., Alves, T. F., Tófoli, L. F., Wang, Y. P., & Andrade, L. H. (2011). Psychiatry: Life events and social support in late life depression. *Clinics, 66(2)*, 233-238. Retrieved from https://search.proquest.com/docview/861793799?accountid=10382

Almeida, O., Hankey, G., Yeap, B., Golledge, J., & Flicker, L. (2014). The triangular association of ADH1B genetic polymorphism, alcohol consumption and the risk of depression in older men. *Molecular Psychiatry, 19*, 995-1000.

Almeida, O. P., Alfonso, H., Yeap, B. B., Hankey, G., & Flicker, L. (2011). Complaints of difficulty to fall asleep increase the risk of depression in later life: The health in men study. *Journal of Affective Disorders, 134*, 208-216. doi:10.1016/j.jad.2011.05.045

Ang, S., & Malhotra, R. (2016). Association of received social support with depressive symptoms among older males and females in Singapore: Is personal mastery an inconsistent mediator? *Social Science & Medicine, 153*, 165-173. doi:10.1016/j.socscimed.2016.02.019

Baiyewu, O., Yusuf, A. J., & Ogundele, A. (2015). Depression in elderly people living in rural Nigeria and its association with perceived health, poverty, and social network. *International Psychogeriatrics, 27(12)*, 2009-2015. doi:10.1017/s1041610215001088

Brinda, E. M., Rajkumar, A. P., Attermann, J., Gerdtham, U. G., Enemark, U., & Jacob, K. S. (2016). Health, social, and economic variables associated with depression among older people in low and middle income countries: World Health Organization study on Global AGEing and Adult Health. *American Journal of Geriatric Psychiatry, 24(12)*, 1196-1208. doi:10.1016/j.jagp.2016.07.016

Cao, W., Guo, C., Ping, W., Tan, Z., Guo, Y., & Zheng, J. (2016). A community-based study of quality of life and depression among older adults. *International Journal of Environmental Research & Public Health, 13(7)*, 693. doi:10.3390/ijerph13070693

Carayanni, V., Stylianopoulou, C., Koulierakis, G., Babatsikou, F., & Koutis, C. (2012). Sex differences in depression among older adults: Are older women more vulnerable than men in social risk factors? The case of open care centers for older people in Greece. *European Journal of Ageing, 9(2)*, 177-186. doi:10.1007/s10433-012-0216-x

Carriere, I., Farre, A., Proust-Lima, C., Ryan, J., Ancelin, M., & Ritchie, K. (2017). Chronic and remitting trajectories of depressive symptoms in the elderly: Characterisation and risk factors. *Epidemiology and Psychiatric Sciences, 26(2)*, 146-156. doi:http://dx.doi.org/10.

1017/S2045796015001122

Castro-Costa, E., Lima-Costa, M. F., Carvalhais, S., Firmo, J. O. A., & Uchoa, E. (2008). Factors associated with depressive symptoms measured by the 12-item General Health Questionnaire in Community-Dwelling Older Adults (The Bambul Health Aging Study). *Revista Brasileira De Psiquiatria, 30(2)*, 104-109. doi:10.1590/s1516-44462008005000007

Chan, A., Malhotra, C., Malhotra, R., & Ostbye, T. (2011). Living arrangements, social networks and depressive symptoms among older men and women in Singapore. *International Journal of Geriatric Psychiatry, 26(6)*, 630-639. doi:10.1002/gps.2574

Chan, D., Kwok, A., Leung, J., Yuen, K., Choy, D., & Leung, P. C. (2012). Association between life events and change in depressive symptoms in Hong Kong Chinese elderly. *Journal of Affective Disorders, 136(3)*, 963-970. doi:10.1016/j.jad.2011.08.031

Chan, M. F., & Zeng, W. (2009). Investigating factors associated with depression of older women in Macau. *Journal of Clinical Nursing, 18(21)*, 2969-2977. doi:10.1111/j.1365-2702.2009.02867.x

Chan, R., Chan, D., & Woo, J. (2014). A prospective cohort study to examine the association between dietary patterns and depressive symptoms in older Chinese people in Hong Kong. *Plos One, 9(8)*, e105760. doi:10.1371/journal.pone.0105760

Chang, Y. C., Lu, M. C., Hu, I. H., Wu, W. C. I., & Hu, S. C. (2017). Effects of different amounts of exercise on preventing depressive symptoms in community-dwelling older adults: A prospective cohort study in Taiwan. *BMJ Open, 7(4)*, 10. doi:10.1136/bmjopen-2016-014256

Chao, Y. Y., Katigbak, C., Zhang, N. J., & Dong, X. (2018). Association between perceived social support and depressive symptoms among community-dwelling older Chinese Americans. *Gerontology & Geriatric Medicine, 4*, 1-8. doi:10.1177/2333721418778194

Cho, J., Jin, Y., & Kang, H. (2018). Weight status, physical activity, and depression in Korean older adults. *Journal of Epidemiology, 28(6)*, 292-299. doi:10.2188/jea.JE20170083

Choi, K. S., Stewart, R., & Dewey, M. (2013). Participation in productive activities and depression among older Europeans: Survey of Health, Ageing and Retirement in Europe (SHARE). *International Journal of Geriatric Psychiatry, 28(11)*, 1157-1165. doi:10.1002/gps.3936

Choi, N. G., & McDougall, G. (2009). Unmet needs and depressive symptoms among low-income older adults. *Journal of Gerontological Social Work, 52(6)*, 567-583. doi:10.1080/01634370802609270

Elliot, A. J., Mooney, C. J., Douthit, K. Z., & Lynch, M. F. (2014). Predictors of older adults' technology use and its relationship to depressive symptoms and well-being. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences, 69(5)*, 667-677. doi:10.1093/geronb/gbt109

Fukunaga, R., Abe, Y., Nakagawa, Y., Koyama, A., Fujise, N., & Ikeda, M. (2012). Living alone is associated with depression among the elderly in a rural community in Japan. *Psychogeriatrics, 12(3)*, 179-185. doi:10.1111/j.1479-8301.2012.00402.x

Garcia-Pena, C., Wagner, F. A., Sanchez-Garcia, S., Espinel-Bermudez, C., Juarez-Cedillo, T., Perez-Zepeda, M., . . . Gallo, J. J. (2013). Late-life depressive symptoms: Prediction models of change. *Journal of Affective Disorders, 150(3)*, 886-894. doi:10.1016/j.jad.2013.05.007

Giltay, E. J., Zitman, F. G., & Kromhout, D. (2006). Dispositional optimism and the risk of depressive symptoms during 15 years of follow-up: The Zutphen elderly study. *Journal of Affective Disorders, 91(1)*, 45-52. doi:10.1016/j.jad.2005.12.027

Glass, T. A., De Leon, C. F., Bassuk, S. S., & Berkman, L. F. (2006). Social engagement and depressive symptoms in late life: Longitudinal findings. *Journal of Aging and Health, 18(4)*, 604-628. doi:10.1177/0898264306291017

Gomes, A. P., Oliveira Bierhals, I., Goncalves Soares, A. L., Hellwig, N., Tomasi, E., Formoso Assuncao, M. C., & Goncalves, H. (2018). Interrelatioship between diet quality and depressive symptoms in elderly. *Journal of Nutrition, Health, & Aging, 22(3)*, 387-392. doi:10.1007/s12603-017-0963-7

Gong, F., Zhao, D., Zhao, Y., Lu, S., Qian, Z., & Sun, Y. (2018). The factors associated with geriatric depression in rural China: Stratified by household structure. *Psychology, Health & Medicine, 23(5)*, 593-603. doi:10.1080/13548506.2017.1400671

Han, H. R., Kim, M., Lee, H. B., Pistulka, G., & Kim, K. B. (2007). Correlates of depression in the Korean American elderly: Focusing on personal resources of social support. *Journal of Cross-cultural Gerontology, 22(1)*, 115-127. doi:10.1007/s10823-006-9022-2

Hua, Y., Wang, B., Wallen, G. R., Shao, P., Ni, C., & Hua, Q. (2015). Health-promoting lifestyles and depression in urban elderly Chinese. *Plos One, 10(3)*, e0117998. doi:10.1371/journal.pone.0117998

Isaac, V. M., Stewart, Robert M. D., Artero, Sylvaine M. D., Ancelin, Marie-Laure PhD and Ritchie, Karen PhD. (2009). Social activity and improvement in depressive symptoms in older people: A prospective community cohort study. *The American Journal of Geriatric Psychiatry, 17(8)*, 688-696.

Jaussent, I., Bouyer, J., Ancelin, M. L., Akbaraly, T., Peres, K., Ritchie, K., . . . Dauvilliers, Y. (2011). Insomnia and daytime sleepiness are risk factors for depressive symptoms in the elderly. *Sleep, 34(8)*, 1103-1110. doi:10.5665/SLEEP.1170

Jeon, H.-S., & Dunkle, R. E. (2009). Stress and depression among the oldest-old: A longitudinal analysis. *Research on Aging, 31(6)*, 661-687. doi:10.1177/0164027509343541

Kaneko, Y., Motohashi, Y., Sasaki, H., & Yamaji, M. (2007). Prevalence of depressive symptoms and related risk factors for depressive symptoms among elderly persons living in a rural Japanese community: A cross-sectional study. *Community Mental Health Journal; New York, 43(6)*, 583-590. doi:10.1007/s10597-007-9096-5

Khaltar, A., Priyadarshani, N. G. W., Delpitiya, N. Y., Jayasinghe, C., Jayasinghe, A., Arai, A., & Tamashiro, H. (2017). Depression among older people in Sri Lanka: With special reference to ethnicity. *Geriatrics & Gerontology International, 17(12)*, 2414-2420. doi:10.1111/ggi.13090

Ku, P. W., Steptoe, A., Liao, Y., Sun, W. J., & Chen, L. J. (2018). Prospective relationship between objectively measured light physical activity and depressive symptoms in later life. *International Journal of Geriatric Psychiatry, 33(1)*, 58-65. doi:10.1002/gps.4672

Kuchibhatla, M. N., Fillenbaum, G. G., Hybels, C. F., & Blazer, D. G. (2012). Trajectory classes of depressive symptoms in a community sample of older adults. *Acta Psychiatrica Scandinavica, 125(6)*, 492-501. doi:10.1111/j.1600-0447.2011.01801.x

Kuroda, A., Tanaka, T., Hirano, H., Ohara, Y., Kikutani, T., Furuya, H., . . . Iijima, K. (2015). Eating alone as social disengagement is strongly associated with depressive symptoms in Japanese community-dwelling older adults. *Journal of the American Medical Directors Association, 16(7)*, 578-585. doi:10.1016/j.jamda.2015.01.078

Lee, C. T., Yeh, C. J., Lee, M. C., Lin, H. S., Chen, V. C. H., Hsieh, M. H., . . . Lai, T. J. (2012). Leisure activity, mobility limitation and stress as modifiable risk factors for depressive symptoms in the elderly: Results of a national longitudinal study. *Archives of Gerontology and Geriatrics, 54(2)*, e221-229. doi:10.1016/j.archger.2011.06.014

Lee, E., Cho, H. J., Olmstead, R., Levin, M. J., Oxman, M. N., & Irwin, M. R. (2013). Persistent sleep disturbance: A risk factor for recurrent depression in community-dwelling older adults. *Sleep: Journal of Sleep and Sleep Disorders Research, 36(11)*, 1685-1691. doi:10.5665/sleep.3128

Lee, H., Lee, J. A., Brar, J. S., Rush, E. B., & Jolley, C. J. (2014). Physical activity and depressive symptoms in older adults. *Geriatric Nursing, 35(1)*, 37-41. doi:10.1016/j.gerinurse.2013.09.005

Lee, L. K., Shahar, S., & Chin, A. V. (2012). Predicting comorbidities, nutritional status, and neuropsychological performance of depressed and nondepressed geriatric communities: A comparative study. *International Journal of Gerontology, 6*, 278-284. doi:10.1016/j.ijge.2012.01.032

Li, J., Theng, Y.-L., & Foo, S. (2015). Depression and psychosocial risk factors among community-dwelling older adults in Singapore. *Journal of Cross-cultural Gerontology, 30(4)*, 409-422. doi:10.1007/s10823-015-9272-y

Li, N., Pang, L., Chen, G., Song, X., Zhang, J., & Zheng, X. (2011). Risk factors for depression in older adults in Beijing. *Canadian Journal of Psychiatry, 56(8)*, 466-473. doi:10.1177/070674371105600804

Lin, S., Liu, J., & Jang, Y. (2014). The role of psychosocial and cultural factors as correlates of depressive symptoms in Chinese-American older adults. *Clinical Gerontologist: The Journal of Aging and Mental Health, 37(2)*, 108-119. doi:10.1080/07317115.2013.868847

Lue, B.-H., Chen, L.-J., & Wu, S.-C. (2010). Health, financial stresses, and life satisfaction affecting late-life depression among older adults: a nationwide, longitudinal survey in Taiwan. *Archives of Gerontology and Geriatrics, 50, Supplement 1*, S34-S38. doi:10.1016/S0167-4943(10)70010-8

Maglione, J. E., Ancoli-Israel, S., Peters, K. W., Paudel, M. L., Yaffe, K., Ensrud, K. E., . . . Study Osteoporotic Fractures Res, G. (2014a). Subjective and objective sleep disturbance and longitudinal risk of depression in a cohort of older women. *Sleep, 37(7)*, 1179-1187. doi:10.5665/sleep.3834

Maglione, J. E., Ancoli-Israel, S., Peters, K. W., Paudel, M. L., Yaffe, K., Ensrud, K. E., . . . Stone, K. L. (2014b). Depressive symptoms and circadian activity rhythm disturbances in community-dwelling older women. *The American Journal of Geriatric Psychiatry, 22(4)*, 349-361. doi:10.1016/j.jagp.2012.09.003

Morikawa, M., Okamoto, N., Kiuchi, K., Tomioka, K., Iwamoto, J., Harano, A., . . . Kurumatani, N. (2013). Association between depressive symptoms and metabolic syndrome in Japanese community-dwelling older people: A cross-sectional analysis from the baseline results of the Fujiwara-kyo prospective cohort study. *International Journal of Geriatric Psychiatry, 28(12)*, 1251-1259. doi:10.1002/gps.3950

Murata, C., Kondo, K., Hirai, H., Ichida, Y., & Ojima, T. (2008). Association between depression and socio-economic status among community-dwelling elderly in Japan: The Aichi Gerontological Evaluation Study (AGES). *Health & Place, 14(3)*, 406-414. doi:10.1016/j.healthplace.2007.08.007

Nakulan, A., Sumesh, T., Kumar, S., Rejani, P., & Shaji, K. (2015). Prevalence and risk factors for depression among community resident older people in Kerala. *Indian Journal of Psychiatry, 57(3)*. doi:10.4103/0019-5545.166640

Nicolosi, G. T., Falcão, D. V. D. S., Batistoni, S. S. T., Lopes, A., Cachioni, M., Neri, A. L., & Yassuda, M. S. (2011). Depressive symptoms in old age: Relations among sociodemographic and self-reported health variables. *International Psychogeriatrics, 23(6)*, 941-949. doi:10.1017/S1041610211000627

Park, J. E., Lee, J.-Y., Kim, B.-S., Kim, K. W., Chae, S. H., & Cho, M. J. (2015). Above-moderate physical activity reduces both incident and persistent late-life depression in rural Koreans. *International Journal of Geriatric Psychiatry, 30(7)*, 766-775. doi:10.1002/gps.4244

Park, M. J. (2017). Impact of social capital on depression trajectories of older women in Korea. *Aging & Mental Health, 21(4)*, 354-361. doi:10.1080/13607863.2015.1088511

Park, Y. H., Choi-Kwon, S., Park, K. A., Suh, M., & Jung, Y. S. (2017). Nutrient deficiencies and depression in older adults according to sex: A cross sectional study. *Nursing & Health Sciences, 19(1)*, 88-94. doi:10.1111/nhs.12315

Piboon, K., Subgranon, R., Hengudomsub, P., Wongnam, P., & Callen, B. L. (2012). A causal model of depression among older adults in Chon Buri Province, Thailand. *Issues in Mental Health Nursing, 33(2)*, 118-126. doi:10.3109/01612840.2011.630497

Pilania, M., Bairwa, M., Khurana, H., & Kumar, N. (2017). Prevalence and predictors of depression in community-dwelling elderly in rural Haryana, India. *Indian Journal of Community Medicine, 42(1)*, 13-18. doi:10.4103/0970-0218.199792

Richardson, T. M., Friedman, B., Podgorski, C., Knox, K., Fisher, S., He, H., & Conwell, Y. (2012). Depression and its correlates among older adults accessing aging services. *The American Journal of Geriatric Psychiatry, 20(4)*, 346-354. doi:10.1097/JGP.0b013e3182107e50

Russell, D., & Taylor, J. (2009). Living alone and depressive symptoms: The influence of gender, physical disability, and social support among Hispanic and non-Hispanic older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences, 64(1)*, 95-104. doi:10.1093/geronb/gbn002

Sachs-Ericsson, N., Burns, A. B., Gordon, K. H., Eckel, L. A., Wonderlich, S. A., Crosby, R. D., & Blazer, D. G. (2007). Body mass index and depressive symptoms in older adults: The moderating roles of race, sex, and socioeconomic status. *American Journal of Geriatric Psychiatry, 15(9)*, 815-825. doi:10.1097/JGP.0b013e3180a725d6

Schwarzbach, M., Luppa, M., Sikorski, C., Fuchs, A., Maier, W., van den Bussche, H., … Riedel-Heller, S. G. (2013). The relationship between social integration and depression in non-demented primary care patients aged 75 years and older. *Journal of Affective Disorders, 145*, 172-178. doi:10.1016/j.jad.2012.07.025

Shin, J. K., Kim, K. W., Park, J. H., Lee, J. J., Huh, Y., Lee, S. B., . . . Woo, J. I. (2008). Impacts of poor social support on general health status in community-dwelling Korean elderly: The results from the Korean longitudinal study on health and aging. *Psychiatry Investigation, 5(3)*, 155-162.

Smagula, S. F., Ancoli-Israel, S., Blackwell, T., Boudreau, R., Stefanick, M. L., Paudel, M. L., . . . Cauley, J. A. (2015). Circadian rest-activity rhythms predict future increases in depressive symptoms among community-dwelling older men. *The American Journal of Geriatric Psychiatry, 23(5)*, 495-505. doi:10.1016/j.jagp.2014.06.007

St John, P. D., Blandford, A. A. & Strain, L. A. (2006). Depressive symptoms among older adults in urban and rural areas. *International Journal of Geriatric Psychiatry, 21*, 1175-1180. doi:10.1002/gps.1637

Sun, F., Park, N. S., Roff, L. L., Klemmack, D. L., Parker, M., Koenig, H. G., . . . Allman, R. M. (2012). Predicting the trajectories of depressive symptoms among southern community-dwelling older adults: The role of religiosity. *Aging & Mental Health, 16(2)*, 189-198. doi:10.1080/13607863.2011.602959

Tani, Y., Sasaki, Y., Haseda, M., Kondo, K., & Kondo, N. (2015). Eating alone and depression in older men and women by cohabitation status: The JAGES longitudinal survey. *Age and Ageing, 44(6)*, 1019-1026. doi:10.1093/ageing/afv145

Tanner, E. K., Martinez, I. L., & Harris, M. (2014). Examining functional and social determinants of depression in community-dwelling older adults: Implications for practice. *Geriatric Nursing, 35(3)*, 236-240. doi:10.1016/j.gerinurse.2014.04.006

Thirthahalli, C., Suryanarayana, S. P., Sukumar, G. M., Bharath, S., Rao, G. N., & Murthy, N. S. (2014). Proportion and factors associated with depressive symptoms among elderly in an urban slum in Bangalore. *Journal of Urban Health; New York, 91(6)*, 1065-1075. doi:10.1007/s11524-014-9903-6

Uemura, K., Makizako, H., Lee, S., Doi, T., Lee, S., Tsutsumimoto, K., & Shimada, H. (2018). Behavioral protective factors of increased depressive symptoms in community-dwelling older adults: A prospective cohort study. *International Journal of Geriatric Psychiatry, 33(2)*, e234-e241. doi:10.1002/gps.4776

Vanoh, D., Shahar, S., Yahya, H. M., & Hamid, T. A. (2016). Prevalence and determinants of depressive disorders among community-dwelling older adults: Findings from the towards useful aging study. *International Journal of Gerontology, 10(2)*, 81-85. doi:10.1016/j.ijge.2016.02.001 van't Veer-Tazelaar, P. J., van Marwijk, H. W. J., Jansen, A. P. D., Rijmen, F., Kostense, P. J., van Oppen, P., . . . Beekman, A. T. F. (2008). Depression in old age (75 +), the PIKO study. *Journal of Affective Disorders, 106(3)*, 295-299. doi:10.1016/j.jad.2007.07.004

Woo, J., Lynn, H., Lau, W. Y., Leung, J., Lau, E., Wong, S. Y. S., & Kwok, T. (2006). Nutrient intake and psychological health in an elderly Chinese population. *International Journal of Geriatric Psychiatry, 21(11)*,

1036-1043. doi:10.1002/gps.1603

Yoo, J. S., Chang, S. J., & Kim, H. S. (2016). Prevalence and Predictive Factors of Depression in Community-Dwelling Older Adults in South Korea. *Research and Theory for Nursing Practice, 30(3)*, 200-211. doi:10.1891/1541-6577.30.3.200

Yoshida, Y., Iwasa, H., Kumagai, S., Suzuki, T., Awata, S., & Yoshida, H. (2015). Longitudinal association between habitual physical activity and depressive symptoms in older people. *Psychiatry and Clinical Neurosciences, 69(11)*, 686-692. doi:10.1111/pcn.12324

Yoshimura, K., Yamada, M., Kajiwara, Y., Nishiguchi, S., & Aoyama, T. (2013). Relationship between depression and risk of malnutrition among community-dwelling young-old and old-old elderly people. *Aging & Mental Health, 17(4)*, 456-460. doi:10.1080/13607863.2012.743961

References

Alexopoulos, G.S., 2005. Depression in the elderly. The Lancet, 365 1961–1970.

Catalan-Matamoros, D., Gomez-Conesa, A., Stubbs, B., Vancampfort, D., 2016. Exercise improves depressive symptoms in older adults: An umbrella review of systematic reviews and meta-analyses. Psychiatry Research 244, 202–209. https://doi.org/10.1016/j.psychres.2016.07.028.

Chapman, D.P., Perry, G.S., 2008. Peer reviewed: Depression as a major component of public health for older adults. Preventing Chronic Disease 5 (1), 1–9.

Chew-Graham, C., Kovandžić, M., Gask, L., Burroughs, H., Clarke, P., Sanderson, H., Dowrick, C., 2012. Why may older people with depression not present to primary care? Messages from secondary analysis of qualitative data. Health & Social Care in the Community 20 (1), 52–60. https://doi.org/10.1111/j.1365-2524.2011.01015.x.

Cole, M.G., Dendukuri, N., 2003. Risk factors for depression among elderly community subjects: A systematic review and meta-analysis. American Journal of Psychiatry 160 (6), 1147–1156. https://doi.org/10.1176/appi.ajp.160.6.1147.

Djernes, J.K., 2006. Prevalence and predictors of depression in populations of elderly: A review. Acta Psychiatrica Scandinavica 113 (5), 372–387. https://doi.org/10.1111/j.1600-0447.2006.00770.x.

Donohue, J.M., Pincus, H.A., 2007. Reducing the societal burden of depression. Pharmacoeconomics 25 (1), 7–24.

Fiorillo, D., Nappo, N., 2017. Formal volunteering and self-perceived health. Causal evidence from the UK-SILC. Review of Social Economy 75 (2), 112–138.

Fiske, A., Wetherell, J.L., Gatz, M., 2009. Depression in older adults. Annual Review of Clinical Psychology 5, 363–389. https://doi.org/10.1146/annurev.clinpsy.032408.153621.

Forsman, A.K., Nordmyr, J., Wahlbeck, K., 2011 a a. Psychosocial interventions for the promotion of mental health and the prevention of depression among older adults. Health Promotion International 26, i85–107. https://doi.org/10.1093/heapro/dar074.

Forsman, A.K., Schierenbeck, I., Wahlbeck, K., 2011 b b. Psychosocial interventions for the prevention of depression in older adults: Systematic review and meta-analysis. Journal of Aging and Health 23 (3), 387–416. https://doi.org/10.1177/0898264310378041.

Fozard, J.L., Wahl, H.W., 2012. Age and cohort effects in gerontechnology: A reconsideration. Gerontechnology 11 (1), 10–21. https://doi.org/10.4017/gt.2012.11.01.003.00.

Hjarsbech, P.U., Andersen, R.V., Christensen, K.B., Aust, B., Borg, V., Rugulies, R., 2011. Clinical and non-clinical depressive symptoms and risk of long-term sickness absence among female employees in the Danish eldercare sector. Journal of Affective Disorders 129, 87–93. https://doi.org/10.1016/j.jad.2010.07.033.

Ichida, Y., Hirai, H., Kondo, K., Kawachi, I., Takeda, T., Endo, H., 2013. Does social participation improve self-rated health in the older population? A quasi-experimental intervention study. Social Science & Medicine 94, 83–90. https://doi.org/10.1016/j.socscimed.2013.05.006.

Kmet, L.M., Cook, L.S., Lee, R.C., 2004. Standard quality assessment criteria for evaluating primary research papers from a variety of fields. Edmonton: Alberta Heritage Foundation for Medical Research 1–22.

Li, C., Jiang, S., Li, N., Zhang, Q., 2018. Influence of social participation on life satisfaction and depression among Chinese elderly: Social support as a mediator. Journal of Community Psychology 46 (3), 345–355.

Liljas, A.E., Walters, K., Jovicic, A., Iliffe, S., Manthorpe, J., Goodman, C., Kharicha, K., 2019. Engaging 'hard to reach'groups in health promotion: The views of older people and professionals from a qualitative study in England. BMC Public Health 19 (1), 629.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., 2009. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. BMJ 339. https://doi.org/10.1136/bmj.b2535.

Reid, K.J., Baron, K.G., Lu, B., Naylor, E., Wolfe, L., Zee, P.C., 2010. Aerobic exercise improves self-reported sleep and quality of life in older adults with insomnia. Sleep Medicine 11 (9), 934–940. https://doi.org/10.1016/j.sleep.2010.04.014.

Rodda, J., Walker, Z., Carter, J., 2011. Depression in older adults. BMJ 343, d5219. https://doi.org/10.1136/bmj.d5219.

Rowe, S.K., Rapaport, M.H., 2006. Classification and treatment of sub-threshold depression. Current Opinion in Psychiatry 19, 9–13.

Singh, A., Okereke, O., 2015. Social and behavioral risk factors for late-life depression. In: Okereke, O. (Ed.), Prevention of Late-Life Depression. Springer, New York, NY, pp. 19–32.

Singh, N.A., Stavrinos, T.M., Scarbek, Y., Galambos, G., Liber, C., Fiatarone Singh, M.A., Morley, J.E., 2005. A randomized controlled trial of high versus low intensity weight training versus general practitioner care for clinical depression in older adults. The Journals of Gerontology: Series A 60 (6), 768–776.

Strine, T.W., Kroenke, K., Dhingra, S., Balluz, L.S., Gonzalez, O., Berry, J.T., Mokdad, A.H., 2009. The associations between depression, health-related quality of life, social support, life satisfaction, and disability in community-dwelling US adults. The Journal of Nervous and Mental Disease 197 (1), 61–64.

Thomas, K., Shute, R., 2006. The old and mentally ill in Australia: Doubly stigmatised. Australian Psychologist 41 (3), 186–192.

United Nations Department of Economic and Social Affairs Population Division. (2017). *World population prospects: The 2017 revision, key findings and advance tables*. Retrieved from esa.un.org/unpd/wpp/Publications/Files/WPP2017_KeyFindings.pdf.

Vink, D., Aartsen, M.J., Schoevers, R.A., 2008. Risk factors for anxiety and depression in the elderly: a review. Journal of Affective Disorders 106, 29–44. https://doi.org/10.1016/j.jad.2007.06.005.

von Faber, M., van der Geest, G., van der Weele, G.M., Blom, J.W., van der Mast, R.C., Reis, R., Gussekloo, J., 2016. Older people coping with low mood: a qualitative study. International Psychogeriatrics 28 (4), 603–612.

Wanderley, F.A., Silva, G., Marques, E., Oliveira, J., Mota, J., Carvalho, J., 2011. Associations between objectively assessed physical activity levels and fitness and self-reported health-related quality of life in community-dwelling older adults. Quality of Life Research 20 (9), 1371–1378. https://doi.org/10.1007/s11136-011-9875-x.

World Health Organization. (2012). *Depression a global public health concern*. Retrieved from www.who.int/mental_health/management/depression/who_paper_depression_wfmh_2012.pdf.

World Health Organization, 2017. Depression and other common mental disorders: Global health estimates. World Health Organization, Geneva.

World Health Organization. (2018). *Depression*. Retrieved from https://www.who.int/news-room/fact-sheets/detail/depression.