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Social determinants of mental health: a review of the evidence

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ABSTRACT – *Background and Objectives:* The aim of this study is to present a non-systematic narrative review of the published evidence on the association between mental health and sociodemographic and economic factors at individual- and at area-level.

Methods: A literature search of PubMed and Web of Science was carried out to identify studies published between 2004 and 2014 on the impact of sociodemographic and economic individual or contextual factors on psychiatric symptoms, mental disorders or suicide. The results and methodological factors were extracted from each study.

Results: Seventy-eight studies assessed associations between individual-level factors and mental health. The main individual factors shown to have a statistically significant independent association with worse mental health were low income, not living with a partner, lack of social support, female gender, low level of education, low income, low socioeconomic status, unemployment, financial strain, and perceived discrimination. Sixty-nine studies reported associations between area-level factors and mental health, namely neighbourhood socioeconomic conditions, social capital, geographical distribution and built environment, neighbourhood problems and ethnic composition.

Conclusions: Most of the 150 studies included reported associations between at least one sociodemographic or economic characteristic and mental health outcomes. There was large variability between studies concerning methodology, study populations, variables, and mental illness outcomes, making it difficult to draw more than some general qualitative conclusions. This review highlights the importance of social factors in the initiation and maintenance of mental illness and the need for political action and effective interventions to improve the conditions of everyday life in order to improve population's mental health.

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Introduction

Mental disorders, which include anxiety, depression, schizophrenia, and alcohol and substance use, are highly prevalent and burdensome worldwide. Mental disorders were estimated to account for 12% of the global burden of disease and for 30.8% of years lived with disability[1]. This burden increased by 37.6% between 1990 and 2010[2]. Therefore, tackling mental health inequalities has become a public health priority.

"Mental or psychological well-being is influenced not only by individual characteristics or attributes, but also by the socioeconomic circumstances in which persons find themselves and the broader environment in which they live"[3]. There is a growing interest in documenting the role of social factors on the aetiology and evolution of mental disorders, such as the relation between socioeconomic status (SES) and mental health. Also an increasing number of studies has focused on the impact of contextual characteristics (defined as neighbourhoods, workplaces, regions, states) on individual mental health and in producing health inequalities.

The aim of this study is to review the studies that examined the association between individual and community demographic and socioeconomic factors and psychiatric symptoms, mental disorders or suicide, focusing on the findings and limitations of the existing studies. Identifying the factors that influence mental health is critical for tailoring interventions and programmes that can improve mental health. This knowledge is particularly important in times of economic crisis, when the living and working conditions are substantially worsened, and social factors may have a higher negative impact on the population's mental health.

This paper intends to review empirical studies and systematic reviews assessing: (a) inequalities in the prevalence and incidence of psychiatric symptoms or common mental disorders related to sociodemographic and economic individual or contextual factors; (b) the association between suicide and sociodemographic and economic individual or contextual factors.

Methods

Data sources and search strategy

A literature search was conducted in PubMed and Web of Science to identify the studies related to mental health (depression, anxiety and suicide) and social determinants (education, income, socioeconomic status, unemployment and neighbourhood/neighbourhood). Search was opened to studies developed in any region of the world, written in English, French, Portuguese or Spanish and published between 2004 and 2014.

More detailed information on the literature search is provided in Fig. 1.

Study selection

Title screening was first conducted to exclude irrelevant and duplicated studies. The abstracts of potential articles were reviewed by two reviewers (MS, GC). Studies were excluded if they were: (a) Opinion papers, letters to the editor, editorials, or comments; (b) Studies dealing with people below 18 years old; (c) Experimental studies about interventions addressed to reduce health inequalities; (d) Studies dealing with mental health issues among some specific populations (participants with medical conditions, in post-disaster situations, veterans, homeless…); (e) Studies in which

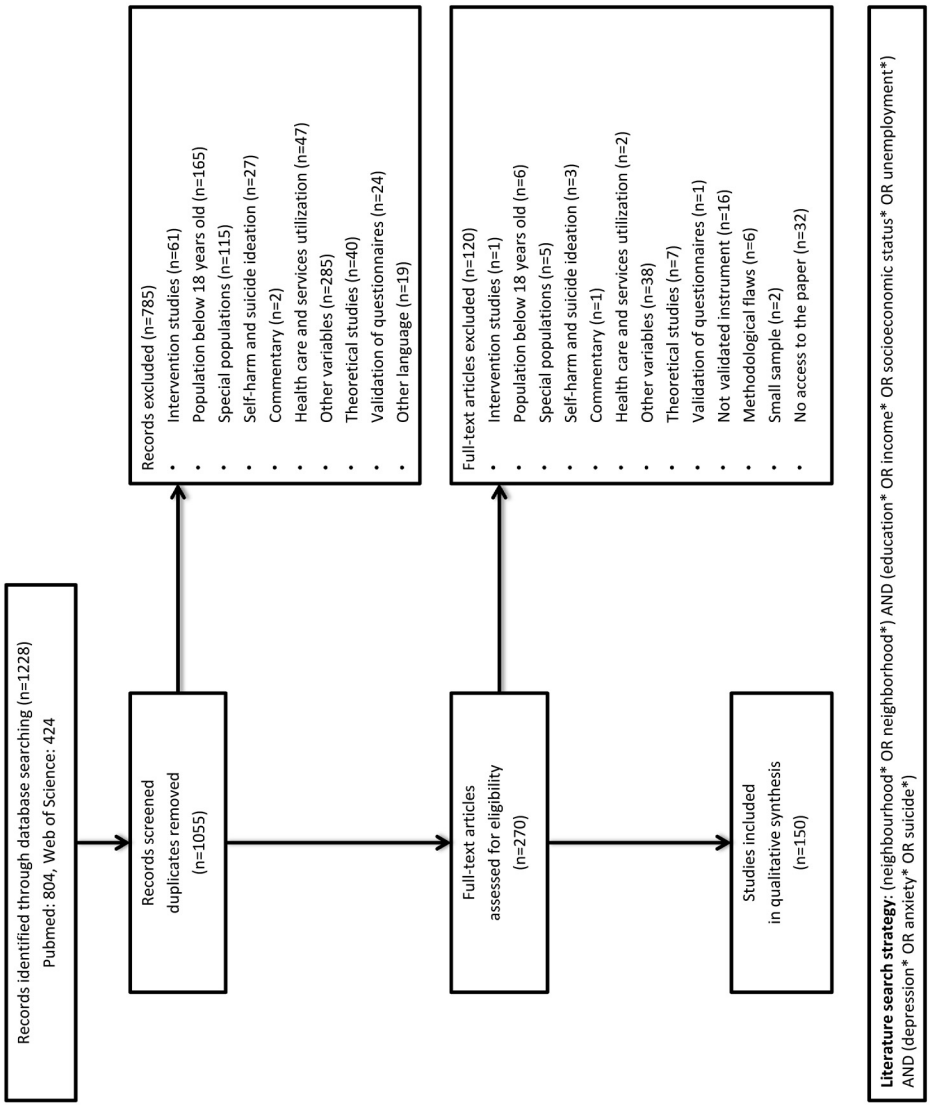

Figure 1. Flow diagram of literature search.

the main health outcome variable was other than psychological distress, depression, anxiety or suicide (such as self-harm and suicide ideation, health care and services utilization or any other variables); (f) Theoretical studies or studies of validation of questionnaires; (g) Studies written in other language than English, French, Portuguese or Spanish.

Articles were reviewed in full when the abstract did not provide enough detail to make a decision. More articles were excluded in this phase if: (a) A validated screening or diagnostic instrument was not used; (b) Methodological flaws were detected (no statistical analysis described; outcome not clearly defined); (c) The sample was too small (fewer than 50 participants); (d) We did not have access to the full paper.

Data collection

The results and methodological factors, including objective(s), definition of sample, location and follow-up period, study design, mental health instrument used or source of data, outcome variable, determinant measured and, statistical methods were extracted from each study. A table with the results was constructed (Table 1). The determinant measured was categorized into two types: individual factor (demographic or socioeconomic) and neighbourhood characteristic. The outcome variable was categorized into three types: mental health or mental disorders, common mental disorders, and suicide.

Official, ethical approval was not requested in view of the nature of this study.

Results

The electronic search identified 1228 titles and 150 documents were accepted. We categorized studies according to the outcome measure, and divided them in studies examining the association of social factors with mental health or mental disorders (34 studies), common mental disorders (94 studies), and suicide (22 studies). We grouped the studies according to the independent variable (individual demographic and socioeconomic factors or neighbourhood characteristics). Thirty-nine studies were conducted in Europe, 67 in North America, 9 in South America, 5 in Africa, 18 in Asia, 8 in Australia, and one in multiple continents. Three of the studies were systematic reviews.

Findings by exposure are briefly summarized below and notable findings are highlighted.

Review of studies on the social determinants of mental health

We included in this category 34 studies whose outcome measure was “psychological distress”, “poor mental health” or “mental disorder”. The independent variables were indicators of individual socioeconomic status or characteristics of the context. The size of the samples varied between n = 143 and n = 4.5 million. Thirteen studies were conducted in Europe, 12 in North America, 1 in Africa, 4 in Asia, and 3 in Australia. One was a systematic review. Five studies used the WHO-5 Well-being Index, 3 the CIDI, 3 the SF-36, and 3 used the GHQ, among other mental health instruments. Most of the studies performed multivariable statistical analysis, with adjustment for covariates, and some of them used multilevel models.

Individual demographic and socioeconomic factors

Cross-sectional panel surveys or nationally representative epidemiological surveys identified risk factors for mental health problems or mental disorders: female gender[4], younger age[4], lower socioeconomic status[5-7], lower income[5,8,9], lower job satisfaction[9], food insufficiency[10], being an immigrant from a low- or middle-income country[8], interpersonal adversity in childhood[7], feeling powerlessness[8], negative life events[8,11], lack of social/emotional support[5,7,8,11,12], and living alone[4] were found to be associated with mental health problems or mental disorders, although the directionality of the association is unclear. In the study conducted by Mundt *et al*.[4] in disadvantaged urban areas, background of migration, low income and educational level were not associated with poor mental health.

Cross-sectional studies cannot distinguish whether these risk factors are associated with the development of new episodes of mental disorders, with increased duration of episodes, or both. Measurement of incidence eliminates the chronicity, selection, and drift interpretation, allowing focus on aetiology, but only a few longitudinal studies were found on this issue.

In the longitudinal studies reviewed the factors associated with worse psychological health over time were female gender[13], lower job satisfaction[13], age lower than 55 years[13], living in common-law relationships or being widowed[13], lower socioeconomic status[14], lower income[13], and financial concerns[14,15]. Caron *et al*.[13], in Canada, found that participants whose primary language was neither French nor English were less at risk than Francophones or Anglophones for developing affective (OR = 0.43) and anxiety disorders (OR = 0.40), or for any disorders (OR = 0.45), with the exception of substance dependence.

Neighbourhood characteristics

Some of the studies reviewed aimed to understand if associations between neighbourhood sociodemographic characteristics and individual symptoms or disorders reflect the characteristics of the individuals who reside in the neighbourhood (compositional) or the neighbourhood characteristics themselves (contextual). The results are conflicting: a cross-sectional study concluded that the chief determinants of current mental health and well-being were those reflecting individual level attributes and perceptions[11], while others suggested that the places in which people live affect their mental health[9,16-18].

Socioeconomic composition

In other studies, neighbourhood deprivation predicted mental health status, particularly on poorer individuals[16], or predicted psychosis and depression, particularly paranoid ideation[19]. On the contrary, Gale *et al*.[18] found no association between area-level deprivation and mental wellbeing. Fone *et al*.[17] found that the adverse effect of income inequality on mental health starts to operate at the larger regional level, and that income inequality at neighbourhood level was associated with better mental health in low-deprivation neighbourhoods. An ecological study[20] concluded that in neighbourhoods with less social contacts and with a higher proportion of jobless persons the admission rates for schizophrenia and depression increased.

Some prospective studies also explored the impact of context on mental disorders. Neighbourhood deprivation was associated with worse mental health[14], increasing psychiatric medication prescription[21], and higher risk of being hospitalised for mental disorder[22], independent of individual-level sociodemographic characteristics. Hamoudi and Dowd[23] concluded that housing market volatility may influence the psychological

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Shaw et al., 2012	To systematically identify relevant studies, summarise their findings and discuss potential explanations of the associations found between ethnic density and mental disorders.	Studies included have a defined ethnic minority sample; some measure of ethnic density defined at a geographical scale smaller than a nation or a US state; and a measure ascertaining mental health or disorder.	Studies published up to January 2011	Adult mental disorders
Brisson et al., 2014	To test how the changing condition of a mother's mental health over time can be predicted by neighborhood problems and collective efficacy.	n=1,949 (low-income mothers)	US, Boston, Chicago, and San Antonio; the Welfare, Children and Families: A Three City Study; 1999, 2000-2001 and 2005-2006	Mental health
Jokela, 2014	To examine whether persons were less healthy when they were living in disadvantaged neighborhoods than at other times when they were living in more advantaged neighborhoods.	n=112,503 person-observations from 20,012 persons	Australia; Household, Income and Labour Dynamics in Australia; 2001-2010 (annual follow-up waves)	Mental health
Gruebner et al., 2012	To identify factors that contribute to the mental well-being in the slums of Dhaka.	n=1,938	Bangladesh, Dhaka; 2009	Mental well-being
Oshio et al., 2013	To examine the extent to which social support and socio-economic status in adulthood mediate the impact of interpersonal adversity in childhood on adult mental health using large-scale population data in Japan	n=3,292 (aged 25–50)	Japan, four municipalities in and around the Tokyo metropolitan area; Japanese Study of Stratification, Health, Income and Neighbourhood; October 2010-February 2011	Mental health
Fone et al., 2007	To investigate multilevel associations between the common mental disorders and economic inactivity measured at the level of the individual and the UK 2001 census ward.	n=10,653 (aged 18–74)	Wales, Caerphilly county borough; Caerphilly Health & Social Needs study; 2001	Mental health
Phongsavan et al., 2006	To investigate the links between dimensions of social capital and mental health morbidity.	n=12,879	Australia, New South Wales; 2003	Psychological distress
Brown et al., 2009	To examine whether architectural features of the built environment theorized to promote observations and social interactions (e.g., porches, windows) predict Hispanic elders' psychological distress.	n=273 (Hispanic, aged +70)	US, East Little Havana, Florida; The Hispanic Elders' Behavioral Health Study; 2002–2003	Psychological distress
Meyer et al., 2014	To investigate the underlying mechanisms of the influence of socioeconomic status on mental health and self-rated health, and evaluate how these relationships might vary by race/ethnicity, age, and gender.	n=44,921	US; California Health Interview Survey; 2009	Psychological distress
Gary et al., 2007	To determine if neighborhood characteristics were associated with mental health outcomes among African-American and white adults living in a socio-economically homogeneous, racially integrated, urban community.	n=1,408	US, Baltimore City, Maryland	Mental health

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
Medline, PsycINFO, Sociological Abstracts, and the Science and Social Science Citation indices of the Web of Science	Ethnic density	Narrative review / Systematic search strategy	A total of 34 papers from 29 data-sets were identified. Protective associations between ethnic density and diagnosis of mental disorders were most consistent in older US ecological studies of admission rates. Among more recent multilevel studies, there was some evidence of ethnic density being protective against depression and anxiety for African American people and Hispanic adults in the USA. However, Hispanic, Asian–American and Canadian 'visible minority' adolescents have higher levels of depression at higher ethnic densities. Studies in the UK showed mixed results, with evidence for protective associations most consistent for psychoses.
BSI	Collective efficacy and neighborhood problems	Longitudinal study / Growth curve models	A unit increase in Collective Efficacy predicts a 0.08 points reduction in the average BSI Total score (β=−0.08; p<0.001), a 0.03 reduction in the average Depression subscale (β=−0.03; p<0.001), a 0.02 reduction in the average Somatization scale (β=−0.02; p<0.001), and a 0.03 decrease in the average Anxiety subscale (β=−0.03; p<0.001). For a one-point increase in the Neighborhood Problems scale, the BSI Total score increases by 0.19 (β=0.19; p<0.001), the BSI depression score increases by 0.07 (β=0.07; p<0.001), the BSI Somatization scale increases by 0.06 (β=0.06; p<0.001), and the BSI Anxiety scale increases by 0.06 (β=0.06; p<0.001).
SF-36	Neighborhood characteristics (neighborhood disadvantage and neighborhood remoteness)	Prospective nationally representative cohort study / Random-intercept multilevel models (linear regression)	Neighborhood disadvantage was associated with poorer mental health. However, the association was almost completely due to between-person differences, and was not replicated in within-person analyses that compared the same persons living in different neighborhoods over time. Results were similar when using neighborhood remoteness as the exposure and when focusing only on long-term residence. In contrast, poor health predicted selective residential mobility to less advantaged neighborhoods, which provided evidence of social selection.
WHO-5 Well-being Index	Neighbourhood, household, and individual-level variables	Baseline data of a cohort study / Multivariable generalised linear regression model	Mental well-being was significantly associated with various factors such as selected features of the natural environment (β=−0.06; p<0.001), flood risk (β=0.06; p<0.001), sanitation (β=0.08; p<0.001), housing quality (β=0.03; p<0.05), sufficiency (β=0.07; p<0.001) and durability (β =0.07; p<0.001). We further identified associations with population density (β=−0.05; p<0.001), job satisfaction (β=0.09; p<0.001), and income generation (β=0.08; p<0.001) while controlling for individual factors such as age, gender, and diseases.
K-6	Parental maltreatment (physical abuse and/or neglect) and bullying in school	Cross-sectional survey/ Multivariate logistic models	Interpersonal adversity in childhood has a negative impact on adult mental health even after controlling for childhood SES. For example, the odds ratio for K6=5+, responding to parental maltreatment, was 2.64 (95% CI 2.04, 3.41). Perceived social support and adult SES mediated 11–24% and 6–12%, respectively, of the impact of interpersonal adversity in childhood on adult mental health. Social support and adult SES (except educational attainment) did not moderate the negative impact of interpersonal adversity in childhood.
MHI-5 scale of the SF-36	Ward level economic inactivity	Cross-sectional nationally representative postal survey / Multilevel linear regression models	Individual mental health status was significantly associated with ward-level economic inactivity, after adjusting for individual-level variables, with a moderate effect size of −0.668 (standard error=0.258). There was a significant cross-level interaction between ward-level and individual economic inactivity from permanent sickness or disability, such that the effect of permanent sickness or disability on mental health was significantly greater for people living in wards with high levels of economic inactivity.
K-10	Social capital	Cross-sectional nationally representative survey / Multiple logistic models	Community participation showed a weak, and neighbourhood connections and reciprocity a moderate (OR=0.89, 95% CI 0.80, 0.98, P<0.05) association with distress. Having higher levels of trust and feeling safe were consistently associated with low levels of psychological distress (OR=0.79, 95% CI 0.72, 0.88, P<0.01), after adjusting for socio-demographic characteristics and health conditions.
Spielberger State Anxiety Inventory and CES-D	Built environment	Baseline assessment of a population-based, prospective cohort study / Structural equation modeling	Architectural features of the front entrance that promote visibility from a building's exterior (such as porches) were positively associated with perceived social support. Architectural features that promote visibility from a building's interior (such as window areas) were negatively associated with perceived social support. Perceived social support was associated with reduced psychological distress after controlling for demographics. Perceived social support mediated the relationship of built environment variables to psychological distress.
K-6	SES	Statewide, population-based health survey / Multiple-group path analysis	Low SES was associated with greater neighborhood safety concerns, which were negatively associated with physical activity, which was then negatively related to mental health and self-rated health. This model was similar across different racial/ethnic and gender groups, but mean levels in the constructs differed across groups.
GHQ Anxiety Subscale, Perceived Stress Scale (PSS), and the Patient Health Questionnaire (PHQ-9)	Neighborhood variables	Cross-sectional survey / Linear and logistic regression analyses	Among African Americans and whites, the perception of severe problems in the community was associated with higher levels of stress (~1.8 units higher), (~1.8 units higher), and depression (OR=~2.0) compared to those who perceived no or few problems (all p<0.05). Community cohesion, the perception that people generally work together, was associated with better mental health among whites only.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Ajrouch et al., 2010	To investigate the association between perceived everyday discrimination and psychological distress among urban African-American women with young children (under 6 years) living in low-income neighborhoods.	n=969	US, Detroit, Detroit Dental Health Project	Psychological distress
Gao et al., 2014	To examine the association between workplace social capital and health status among Chinese employees.	n=2,796	China, Shangai; March to November 2012	Mental health
Sorsdahl et al., 2011	To examine the relationship between food insufficiency and mental disorders.	n=4,185	South Africa; South African Stress and Health Study; January 2002–June 2004	12-month and lifetime DSM-IV diagnosis
Crump et al., 2011	To determine whether neighborhood deprivation is independently associated with psychiatric medication prescription in a national population.	n=6,998,075 (all Swedish adults)	Sweden; July 1, 2005–December 31, 2007	Prescription of psychiatric medications (antipsychotics, antidepressants, anxiolytics, or hypnotics/sedative)
Sundquist et al., 2014	To analyze whether there is an association between linking social capital and prescription of antipsychotics, anxiolytics, hypnotics/sedatives, antidepressants, or anti-dementia drugs.	n=1,292,816 (entire Swedish population aged +65)	Sweden; July 1, 2005 until first prescription of psychiatric medication, death, emigration, or the end of the study on December 31, 2010	First prescription of psychiatric medication
Caron et al., 2012	1) to assess the prevalence and incidence of psychological distress, mental disorders, substance abuse, parasuicide, risky behaviour and quality of life; 2) to examine the links and interactions between individual determinants, neighbourhood ecology and mental health in each neighbourhood; 3) to identify the conditions facilitating the integration of individuals with mental health problems; 4) to analyse the impact of the social, economic and physical aspects of the neighbourhoods using a geographic information system; 5) to verify the adequacy of mental health services.	n=2,433 (aged 15–65)	Canada, Montreal; Epidemiological Catchment Area Study	Mental disorders
Buu et al., 2011	To examine the effects of women's psychopathology history, their social support, their husbands' and children's symptomatology, family stress, and neighborhood environment on their alcohol problems, antisocial behavior, and depression.	n=273	US, Michigan; Michigan Longitudinal Study; first five assessment waves over a 12-year period	Alcohol, antisocial and depressive symptomatology
Mundt et al., 2014	To assess which social characteristics were associated with psychological distress within a disadvantaged, multi-ethnic neighbourhood.	n=143 (aged 18–57)	Germany, Berlin; 2009	Psychological distress
Beutel et al., 2004	To determine (a) the relationship between physical and somatoform complaints, distress, life satisfaction and ageing in the female community and (b) to identify their psychosocial determinants	n=2,771 (aged 16–96)	Germany; 1994 and 1998	Psychological disorders
Fujiwara & Kawachi, 2008	To investigate the impact of social capital on physical and mental health among adult twins in the US.	n=1,888 (944 twin pairs)	US; National Survey of Midlife Development in the US (1995–1996); analyzed in 2007	Depressive symptoms and major depression
German et al., 2011	To determine the prevalence of depressive symptoms and food insufficiency, and to examine the relationship between dietary intake, food insufficiency and depression, in LSES community dwelling elderly.	n=112; community-dwelling welfare recipients aged 60–92	Israel, Lod; December 2003	Depressive symptoms

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
CES-D	Perceived discrimination and social support	First phase of a longitudinal survey / Hierarchical regression analyses	Both moderate and high frequency levels of discrimination were associated with higher levels of psychological distress after controlling for age, education, income, and self-rated health. The availability of emotional support was associated with less psychological distress. Instrumental support exerted a buffering effect to mitigate the negative influence of moderate levels of perceived discrimination on psychological distress.
WHO-5 Well-Being Index	Workplace social capital	Cross-sectional study / Multilevel logistic regression analysis	After controlling for individual-level socio-demographic and lifestyle variables, compared to workers with the highest quartile of personal social capital, workers with the third, second, and lowest quartiles exhibited 1.39 to 3.54 times greater odds of poor mental health, 1.39 (95% CI 1.10, 1.75), 1.85 (95% CI 1.38, 2.46) and 3.54 (95% CI 2.73, 4.59), respectively. Corresponding odds ratios for workplace-level social capital were 0.95 (95% CI 0.61, 1.49), 1.14 (95% CI 0.72, 1.81) and 1.63 (95% CI 1.05, 2.53) for the third, second, and lowest quartiles, respectively.
WHO–CIDI	Household food insufficiency	Cross-sectional nationally representative survey / Logistic regression	After controlling for conventional socioeconomic and sociodemographic variables, food insufficiency was associated with having any 12-month (OR=1.44, 95% CI 1.1, 1.9) and lifetime (OR=1.35, 95% CI 1.1, 1.7) DSM-IV disorder.
Outpatient and inpatient psychiatric medication data	Neighborhood deprivation (index of education, income, unemployment, and welfare assistance)	Follow-up study / Multilevel logistic regression	For each psychiatric medication class, a monotonic trend of increasing prescription was observed by increasing level of neighborhood deprivation. The strongest associations were found for antipsychotics and anxiolytics, with adjusted odds ratios of 1.40 (95% CI 1.36, 1.44) and 1.24 (95% CI 1.22, 1.27), respectively, comparing the highest- to the lowest-deprivation neighborhood quintiles.
Dispensation of a prescribed psychiatric medication at any outpatient or inpatient pharmacy	Neighborhood linking social capital	Population-based cohort study / Multilevel logistic regression	There was an inverse association between the level of linking social capital and prescription of psychiatric medications (except for antidementia drugs). The associations decreased, but remained significant, after accounting for age, sex, family income, marital status, country of birth, and education level (except for antidepressants). The OR for prescription of antipsychotics in the crude model was 1.65 (95% CI 1.53, 1.78) and decreased, but remained significant (OR=1.26; 95% CI 1.17, 1.35), after adjustment for the individual-level sociodemographic variables.
CIDI	Socio-demographic and economic data	Longitudinal, community-survey / Multivariable logistic regressions	Men had a lower risk of suffering from affective (OR=0.62) or anxiety (OR=0.39) disorders than women. Participants aged 55 years and over showed the lowest rates of any type of measured mental disorder, but those aged 34-45 presented a higher risk for anxiety disorders (OR=2.13). Marital status was not related to affective disorders; however, people living in common-law relationships (OR=2.36) or who were widowed (OR=3.43) showed an increased risk for anxiety disorders. All participants whose income was lower than $70,000 were at increased risk for each disorder; the risk increased systematically as income decreased. The level of education was unrelated to any category of disorders. Participants whose primary language was neither French nor English were less at risk than Francophones or Anglophones for affective (OR=0.43) and anxiety disorders (OR=0.40), or for any disorders (OR=0.45).
Drinking and Drug History Questionnaire (DDHQ), Antisocial Behavior Checklist (ASB) and Hamilton Rating Scale for Depression (HRSD)	Women's psychopathology history, their social support, their husbands' and children's symptomatology, family stress, and neighborhood environment	Longitudinal prospective study / Linear mixed modeling	Women's disorder history and their partners' parallel symptomatology were associated with their symptoms. Higher levels of social support were associated with lower levels of depression in women. Neighborhood residential instability was associated with higher levels of alcoholic and depressive symptomatology in women.
GHQ-28	Socio-demographic measures	Cross-sectional study / Logistic regression analysis	Psychological distress was associated with younger age (OR=0.95, 95% CI 0.92, 0.98, p=0.004), female gender (OR=3.51, 95% CI 1.55, 7.92, p=0.003) and living alone (OR=3.88, 95% CI 1.58, 9.52, p=0.003), but not with background of migration, low educational level or with unemployment.
HADS-D	Sociodemographic variables (age, residence, partnership, education, religious affiliation, urbanity, net household income) and subjective health	Two nationally representative cross-sectional surveys / Multiple regression analysis	A substantial proportion of variance (39%) of depression (HADS) was explained by a negative subjective health, higher age, unemployment, rural residency, lack of a partnership and no religiosity. Anxiety was predicted to a lower extent (26%) by low subjective health and unemployment, religiosity, a higher age and residence in eastern Germany.
CIDI-SF	Individual-level social capital variables (social trust, sense of belonging, volunteer activity, and community participation)	Cross-sectional nationally representative survey / Fixed-effects model	In the individual data analysis, social trust, sense of belonging, and community participation were each significantly associated with health outcomes. In the fixed-effects model, major depression was not associated with social capital.
15-Geriatric Depression Scale	Dietary intake and food insufficiency	Cross-sectional study / Multivariate logistic regression analysis	Controlling for confounding variables, an increase of 1 mg in vitamin E intake and 1 gram in polyunsaturated fatty acids intake was associated with lower risk for depression (OR=0.73, p=0.008 and OR=0.86, p=0.007 respectively). Participants who reported food insufficiency were 10 times more likely to be depressed compared with those who reported sufficient food.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Gee & Takeuchi, 2004	To examine whether health is associated with individually perceived traffic stress and as well as ecologically measured vehicular burden.	n=1,503 (Chinese Americans)	US, Los Angeles; Chinese American Psychiatric Epidemiologic Study; 1995	Depressive symptoms
Echeverría et al., 2008	To examine associations between measures of neighborhood problems and neighborhood social cohesion with depression, smoking, drinking, and walking for exercise.	n=5,943 (aged 45–84)	US, six communities in the US; Multi-Ethnic Study of Atherosclerosis cohort; July 2000-August 2002	Depression
Illanes et al., 2007	To determine the prevalence of anxiety and depressive symptoms in women and to determine factors associated with them.	n=422 (women living in a medium to low income neighborhood)	Chile, Temuco	Mental health
Miranda et al., 2005	To examine the prevalence of depression, somatization, alcohol use and drug use among black American women, comparing rates of disorders among US-born, Caribbean-born, and African-born subsamples.	n=9,151 (7,965 born in the US, 913 born in Africa, and 273 born in the Caribbean) (low-income pregnant and postpartum women)	US, Washington DC; WE Care; March 1997-May 2001	Depression, somatization, alcohol use and drug use
Kim et al., 2013	To identify whether the impact of poverty might be moderated by multilevel factors such as sense of control, social support, and neighborhood environment.	n=2,614 (aged +65)	US; Health and Retirement Study; 2006	Depressive symptoms
Wang et al., 2013	To determine the prevalence and correlates of anxiety disorders among empty-nest older adults in Sichuan Province, China.	n=352 (aged +60)	China, Sichuan Province; Sichuan Empty-Nest Elderly Health Survey; July-October 2010	Level of anxiety
Fortney et al., 2007	To examine the association between depression hospitalization rates and community-level sociodemographic, economic, and health care system characteristics.	n=551,529 depression related hospitalizations (aged +20)/65,090,031 residents	US, 14 states; 2000	Standardized hospitalization rate
Mair et al., 2008	To examine associations of neighborhood social cohesion, violence, and aesthetic quality with depressive symptoms.	n=2,619	US; Multiethnic Study of Atherosclerosis; 2000-2002 and at two follow-up visits (3–4 years and 4–5 years after baseline)	Depressive symptoms
Gorn et al., 2005	To explore the relationship of some sociodemographic variables with the presence of depressive disorders among a low-income urban sample.	n=1,156	Mexico, four low-income communities located in southern Mexico City.	Depressive disorder
Steptoe et al., 2007	To assess associations between depressive symptoms and individual level and ecological level factors.	n=17,348 (university students)	23 high-, middle-, and low-income countries; The International Health and Behaviour Study	Depressive symptoms
Murayama et al., 2013	To examine the longitudinal associations of bonding and bridging social capital with self-rated health, depressive mood, and cognitive decline in community-dwelling older Japanese.	n=681 (aged +65)	Japan, Hatoyama in Saitama; Hatoyama Cohort Study; 2010 and 2012	Depressive mood

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
SCL-90-R	Traffic stress and neighborhood conditions	Cross-sectional survey / Multilevel analysis (hierarchical linear modeling)	Perceived traffic stress was associated with depression in multivariate multilevel models, such that persons reporting traffic stress had lower health status and more depressive symptoms. Further, there was an interaction between vehicular burden and traffic stress for depression. Persons who lived in areas with greater vehicular burden and who reported the most traffic stress also had the greatest depressive symptoms.
CES-D	Neighborhood problems and neighborhood social cohesion	Baseline data from a multi-ethnic, population-based prospective cohort study / Linear regression or binomial regression	Individuals living in the least problematic neighborhoods were significantly less likely to be depressed (mean difference in log CES-D=−0.36, CI −0.42, −0.30). Less socially cohesive neighborhoods were associated with increased depression (mean difference in log CES-D=0.21, CI 0.15, 0.27). Results persisted after adjusting for individual-level variables. Each measure appeared to capture distinct features of the neighborhood and associations did not differ by race/ethnicity.
SRQ-20	Partner violence, family conflict and violence, and sociodemographic factors	Cross-sectional study / Logistic regression analyses	The main associated factors with the anxiety or depressive symptoms were severe physical violence against children (OR=14.3), sexual violence against women (OR=9.7), self perception of health (OR=4.5), alcohol abuse (OR=4.4), psychological violence during childhood (OR=3.2) and lack of family support network (OR=2.7). Unemployment and lack of a support network of relatives had an OR 3.3 for mental health alterations. The OR for psychological violence plus sexual violence was 18.5. The figure for psychological violence plus sexual violence plus a history of parental violence during childhood was 26.5.
PRIME-MD	Demographic data	Cross-sectional study / Logistic regression analyses	Controlling for other predictors, US-born black women had odds of probable depression that were 2.94 times greater than the African-born women (p<0.0001, 95% CI 2.07, 4.18) and 2.49 times greater than Caribbean-born women (p<0.0016, 95% CI 1.41, 4.39). Likelihood of somatization did not differ among women who were US born, African born, or Caribbean born.
CES-D	Participants' poverty status, sense of control and social support, and neighborhood environment	Cross-sectional national survey / Hierarchical multiple regression	The elderly poor, especially older women, were more likely to be depressed. Support from friends significantly moderated the association between depression and poverty among older women (β=0.119, p=0.047).
SAS	Symptoms of depression, perceived loneliness, cognitive function, general health, and sociodemographic factors	Cross-sectional study / Multiple regression analysis	The levels of anxiety were significantly different in terms of the patients' gender, educational level, occupation, residence, marital status, and income, but not in terms of their age. Patient anxiety had a significantly positive association with depression and loneliness but had a significantly negative association with the MMSE scores. Multiple regression analysis revealed that patients with depression, loneliness, and cognitive impairment, as well as patients who were female, living in rural areas, or living alone were at risk for anxiety disorders.
Depression hospitalizations	Socio-demographic, economic, and health system characteristics of the counties	Ecological study with spatial analysis / Bayesian spatial regression model	Significant risk factors included unemployment, poverty, physician supply, and hospital bed supply. Significant protective factors included rurality, economic dependence, and housing stress.
CES-D	Neighborhood characteristics (social cohesion, violence, and aesthetic quality)	Longitudinal study / Marginal maximum likelihood estimation	Lower levels of social cohesion and aesthetic quality and higher levels of violence were associated with higher mean CES-D scores in men and women (p for trend <0.01, adjusted mean difference in CES-D per 1 SD increase in summary score −1.01 [95% CI −1.85, −0.17] and −1.08 [95% CI −1.88, −0.28] in men and women, respectively). Associations of neighborhood characteristics with incident depression were in the expected direction for women but confidence intervals were wide (odds ratio of incident depression=0.89 [0.63, 1.26]). No association was seen for men (OR=0.96 [0.74, 1.25]).
CIDI	Socio-demographic variables	Cross-sectional study / Logistic regression model	A higher prevalence of depressive disorders was found among females, among people that experienced loss or family rupture and among those with lower economic resources. The prevalence of depressive disorders in the group of men that had ever married was lower (4.9%) than the prevalence found in the group of married men (5.8%), but single women presented more depressive problems (13.2%) than married women (5.3%).
BDI	Individual level and ecological level factors	Cross-sectional study / Multi-level random effects regression models	Wide variations in depressive symptoms were observed between countries, with lower levels in Western and Southern Europe and South and North America, intermediate levels in Central and Eastern Europe, and higher levels in Pacific-Asian samples. Poorer socio-economic background and low sense of control were associated with depressive symptoms within each country. Independently of individual level effects, higher depressive symptoms were recorded in countries with greater income inequality and with less individualistic cultures.
GDS	Bonding and bridging social capita	Longitudinal study / Logistic regression analysis	After adjusting for sociodemographics, lifestyle factors, comorbidity, functional capacity, baseline score of each outcome, and other bonding/bridging social capital, stronger perceived neighborhood homogeneity was inversely associated with depressive mood assessed by the Geriatric Depression Scale (OR=0.58, 95% CI 0.34, 0.99). When participants who reported a depressive mood at baseline were excluded, stronger perceived heterogeneous network was inversely associated with depressive mood (OR=0.40, 95% CI 0.19, 0.87).

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Marshall et al., 2014	To test whether the extent of inequality in house prices within neighbourhoods of England is associated with depressive symptoms in the older population, and to test two competing hypotheses, the 'wealth inequality hypothesis' and the 'mixed neighbourhood hypothesis'.	n=10,644	England; English Longitudinal Study of Ageing; 2002-2003	Depression
Kingston, 2013	To test the hypothesis that marital status, perceived social support and neighborhood collective efficacy can moderate the effects of economic adversity on depressive symptoms among parents.	n=1,957 (mothers of minor children)	US, Chicago; Project on Human Development in Chicago Neighborhoods	Depressive symptoms
Tong et al., 2011	To examine the effects of social exclusion on depressive symptoms in older Chinese who are living alone.	n=228 (aged +60)	China, Shangai; August-October 2008	Depressive symptoms
McLaughlin et al., 2012	To examine the effects of foreclosure on psychiatric symptomatology in a prospective, population-based community survey.	n=1,547	US, Detroit; Detroit Neighborhoods and Health Study; 2008 and 2010	Symptoms of major depression and GAD
Wee et al., 2014	To assess prevalence of depression amongst community-dwelling elderly in a multiethnic, urban, low-SES, Asian neighborhood, comparing against a higher SES neighborhood.	n=559 (aged +60)	Singapore; January-February 2012	Depression
Mair et al., 2010	To investigate cross-sectional associations of neighborhood racial/ethnic composition with depressive symptoms.	n=5,667	US, Baltimore MD, New York NY, Chicago IL, Los Angeles CA, Minneapolis MN, and Forsyth County NC; Multi-Ethnic Study of Atherosclerosis; 2000-2002	Depressive symptoms
Li et al., 2014	To examine whether physical infrastructure and availability of three types of community resources (old-age income support, healthcare facilities, and elder activity centers) in rural villages are associated with depressive symptoms among older adults in rural China.	n=3,824 (aged +60)	China; Chinese Health and Retirement Longitudinal Study; 2011	Depressive symptoms
Walters et al., 2004	To determine the association of depression and anxiety with "area deprivation" (neighborhood socioeconomic deprivation) and population density among people older than 75 years in Britain.	n=13,349 (aged +75)	Britain; 1995-1999	Depression and anxiety
Chou and Cheung, 2013	This study (1) examines the prevalence of DSM-IV MDD across different demographics, especially the vulnerable ones; (2) identifies clinical characteristics of DSM-IV MDD, such as onset, course, and treatment; and (3) evaluates the comorbidity of DSM-IV MDD with anxiety disorder, substance-use disorder, and personality disorder.	n=8,205 (aged +65)	US; National Epidemiologic Survey on Alcohol and Related Conditions; 2001–2002	Major depressive disorder, anxiety, and substance-use disorders
Siefert et al., 2007	To examine modifiable risk and protective factors for probable depression.	n=824 (African American mothers)	US, Detroit	Probable depression

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
CES-D	House prices	First wave of a longitudinal nationally representative study / Multilevel models	Results were supportive of the mixed neighbourhood hypothesis, a significant association was found between neighbourhood inequality and depression with lower levels of depression amongst older people in neighbourhoods with greater house price inequality after controlling for individual socio-economic and area correlates of depression. The association between area inequality and depression was strongest for the poorest individuals, but also holded among the most affluent.
CES-D	Marital status, household income, financial strain, neighborhood socioeconomic status, perceived social support and collective efficacy	Final wave of a longitudinal cohort study / Hierarchical Linear Modeling	Analysis of main effects revealed associations between neighborhood SES (β=−0.69, SE (0.15), p<0.001), family income (β=−0.11, SE (0.05), p=0.02), financial strain (β=0.51, SE (0.18), p=0.004), being single (β=0.63, SE (0.24), p=0.009) and perceived social support (β=−0.22, SE (0.03), p<0.001) on depressive symptoms. The hypothesis that interpersonal resources can buffer the effects of economic adversity was not supported. There were no significant interactions between marital status and economic adversity. There was a significant interaction between perceived social support and neighborhood level socioeconomic status (β=−0.07, SE (0.03), p=0.04) but the effects of social support were weakest in neighborhoods characterized by low socioeconomic status.
15-item Chinese version Geriatric Depression Scale	Social exclusion (income adequacy, social relations, civic participation, and housing condition)	Cross-sectional study / Hierarchical multiple regression	When controlled for the demographics and health variables, social exclusion variables, represented by a lower level income adequacy, a less favourable housing condition, and feeling more lonely, correlated significantly with more depressive symptoms, accounting for 35.8% of the variance in depressive symptoms in the final regression model.
PHQ-9 and GAD-7	Foreclosure	Propspective community-based study / Logistic regression	Exposure to foreclosure between waves 1 and 2 predicted symptoms of major depression and GAD at wave 2, controlling for symptoms at wave 1. Even after adjusting for wave 1 symptoms, sociodemographics, lifetime history of psychiatric disorder at wave 1 and exposure to other financial stressors between waves 1 and 2, foreclosure was associated with an increased rate of symptoms of major depression [incidence density ratio (IDR) 2.4, 95% CI 1.6, 3.6] and GAD (IDR 1.9, 95% CI 1.4, 2.6).
15-GDS	Individual/area measures of SES	Cross-sectional study / Multilevel logistic regression	In the low-SES community, 26.2% (104/397) had depression, compared with 14.8% (24/162) in the higher SES community. After adjusting for other sociodemographic variables, staying in a low-SES community (public rental housing) was independently associated with depression (adjusted OR=1.68, 95% CI 1.02, 2.84). Within the low-SES community, not being married (aOR=2.27, CI 1.35, 3.70), falls (aOR=2.72, CI 1.59, 4.67), visual impairment (aOR=2.37, CI 1.28, 4.39), and poorer social network (aOR=3.70, CI 1.96, 7.14) were associated with depression.
CES-D	Percentage of residents of the same racial/ethnic background in each participant's census tract	Baseline examination of a longitudinal study / Multilevel models	Living in a neighborhood with a higher percentage of residents of the same race/ethnicity was associated with increased CES-D scores in African American men ($p < 0.05$), and decreased CES-D scores in Hispanic men and women and Chinese women, although these differences were not statistically significant. Models were further adjusted for neighborhood-level covariates (social cohesion, safety, problems, aesthetic quality and socioeconomic factors) derived from survey responses and census data. Adjusting for other neighborhood characteristics strengthened protective associations amongst Hispanics, but did not change the significant associations in African American men.
CES-D	Physical infrastructure and availability of community resources	Baseline data of a longitudinal nationally representative survey / Multilevel logistic regression	Controlling for individuals' socioeconomic status, health status, and demographic characteristics, village infrastructure deficiency was positively associated with the odds of being depressed among rural older Chinese (OR=1.040, 95% CI 1.018, 1.063), whereas the provision of income support and healthcare facilities in rural villages was associated with lower odds.
GDS and GHQ-28	Neighborhood socioeconomic deprivation and population density	Cross-sectional survey / Multiple logistic regression	Living in the most socioeconomically deprived areas was associated with depression (OR=1.4), but this relation disappeared after adjusting for individual deprivation characteristics. There was no association with anxiety. Living in the highest density and intermediate low-density areas was associated with depression (OR=1.6 and 1.5) and anxiety (OR=1.5 and 1.3) compared with the lowest density areas.
AUDADIS- IV	Demographic characteristics	Cross-sectional nationally representative survey / Logistic regression	Marital status and gender were associated with MDD, whereas race and socioeconomic characteristics were not. Specifically, the prevalence rates of past-year MDD were significant greater for females (3.6%) than males (2.0%) and higher for widowed (4.9%) or separated/divorced (3.5%) than married (1.85%). Anxiety disorder, substance dependence, and pathological gambling were highly associated with MDD.
CES-D	Poverty and racial/ethnic minority status	Cross-sectional study / Logistic regression	Household food insufficiency and deteriorated housing significantly increased the odds of likely depression, whereas availability of a loan in a crisis, help with childcare, and transportation were protective. However, more frequent experiences of everyday discrimination greatly increased the odds of elevated depressive symptoms.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Beard et al., 2009	To investigate the relationship between the depressive symptoms of older adults over time and the characteristics of the neighborhoods in which they live.	n=808	New York City, US; 2005 and 2007	Depressive symptoms
English et al., 2014	To examine neighborhood racial composition and sociodemographic factors as antecedents to experienced racial discrimination and resultant levels of depressive symptoms among African American adults.	n=505	US, Baltimore; 2005-2009 and 2009-2012	Depressive symptoms
Henderson et al., 2005	To investigate the relation between neighbourhood socioeconomic and ethnic characteristics with depressive symptoms.	n=3,437 (aged 28–40)	US, Birmingham AL, Chicago IL, Minneapolis MN, from a health plan in Oakland CA; CARDIA study; 1995-96	Depressive symptoms
Cutrona et al., 2005	To test neighborhood context, negative life events, and negative affectivity as predictors of the onset of major depression among African American women.	n=720	US, outside of large, metropolitan, inner cities; Family and Community Health Study; 1997 and 1999	Major depression
Chou, 2012	To examine whether perceived discrimination affects depressive symptomatology in a representative sample of newly arrived immigrants from Mainland China to Hong Kong.	n=347	China, Hong Kong; 2007 and 2008	Depressive symptoms
Garbarski, 2010	To examine whether perceived social position and three different health outcomes were reciprocally related.	n=5,731	US; Wisconsin Longitudinal Study; 1993 and 2004	Depressive symptoms
Batistoni et al., 2010	To identify sociodemographic factors associated with patterns of incidence, remission and stability of depressive symptoms in community-dwelling elderly individuals.	n=310 (aged +60)	Brazil, Juiz de Fora; 2002 and 2004	Depressive symptoms
Heilemann et al., 2004	To identify the most useful acculturation parameter for examining depressive symptoms in relation to strengths and resources among women of Mexican descent living in the United States during the vulnerable perinatal period and to examine other intragroup differences among the women by childbearing status (pregnant or postpartum).	n=129	US	Depressive symptoms
Weich et al., 2006	To investigate rural/non-rural differences in the onset and maintenance of episodes of common mental disorders, after adjusting for the characteristics of respondents and their households.	n=7,659	England, Wales, and Scotland; 1991 and 1992	Common mental disorders
Glei et al., 2013	To assess female–male differences in depressive symptoms among older Taiwanese and quantify the contribution of sex differences in exposure and response to selected covariates in explaining the gap.	n=4,049 (aged +60)	Taiwan; Taiwan Longitudinal Survey of Aging; 1993, 1996, 1999, 2003, and 2007	Depressive symptoms

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
Patient Health Questionnaire (PHQ)	Characteristics of the neighborhoods	Longitudinal study / Multivariable models	In multivariable models that adjusted for individual-level covariates including income, a range of neighborhood characteristics predicted worsening depressive symptoms. Factor analysis suggested that these characteristics operated in 3 clusters: neighborhood socioeconomic influences, residential stability, and racial/ethnic composition, with positive neighborhood socioeconomic influences being significantly protective against worsening symptoms (β=–0.48; 95% CI –0.83, –0.12). Life stressors, personality trait neuroticism, African American race, and daily baseline contact with social networks were also associated with worsening symptoms.
CES-D	Experienced racial discrimination, neighborhood racial composition and sociodemographic factors	Longitudinal study / Structural Equation Modeling	Experienced racial discrimination was positively associated with age and sex such that older individuals and males experienced increased levels of racial discrimination. In addition, the percentage of White individuals residing in a neighborhood was positively associated with levels of experienced racial discrimination for African American neighborhood residents. Experienced racial discrimination was positively associated with later depressive symptoms (β=0.13, p<0.01).
CES-D	Individual level socio-economic indicators and neighbourhood characteristics	Cross-sectional survey / Multiple regression	For each race-sex group, CES-D was inversely related to neighbourhood score and individual income and education. Associations of neighbourhood score with CES-D became weak and inconsistent after adjusting for individual level factors; personal income remained strongly and inversely associated with CES-D. Age adjusted mean differences (standard errors) in CES-D between the lowest and highest income categories were 3.41 (0.62) for white men, 4.57 (0.64) for white women, 5.80 (0.87) for black men, and 5.74 (0.83) for black women. For both black and white participants, CES-D was associated negatively with percentage of white people and positively with percentage of black people in their census block, before, but not after, adjustment for individual and neighbourhood socioeconomic variables.
UM-CIDI	Neighborhood-level economic disadvantage, neighborhood-level social disorder, negative life events and personality	Longitudinal study / Multilevel logistic regression	Neighborhood-level economic disadvantage (e.g., percentage of residents below the poverty line) and social disorder (e.g., delinquency, drug use) predicted the onset of major depression when controlling for individual-level demographic characteristics. Neighborhood-level disadvantage/disorder interacted with negative life events, such that women who experienced recent negative life events and lived in high disadvantage/disorder neighborhoods were more likely to become depressed than were those who lived in more benign settings, both concurrently and over a 2-year period.
CES-D	Perceived discrimination	Longitudinal study / Regression models	Perceived discrimination was significantly associated with depressive symptoms one year later, after adjusting for depressive symptoms at baseline assessment, sociodemographic characteristics, social support, and neighborhood collective efficacy. Moreover, both social support and neighborhood collective efficacy moderated the effect of perceived discrimination on depressive symptoms.
CES-D	Perceived social position	Longitudinal cohort study / Structural equation modeling	The relationship between perceived social position and health differed across health outcomes, as well as across operationalizations of perceived social position. Having depressive symptoms affected perceived social position rather than the reverse or a reciprocal relationship.
CES-D	Sociodemographic variables	Prospective study / Univariate logistic regression analysis	There were no differences in the prevalence of depressive symptoms between T1 and T2 (33.8%). A total of four groups were identified, according to the progression of symptoms from the first to the second measure: without depressive symptoms (50.9%); recurrence (19.7%); incidence (15.2%); and remission (14.2%). Scoring for depression in T1, being female and having a low level of education represented risks of manifesting depressive symptoms in T2.
CES-D	Acculturation, intrinsic strength factors, extrinsic resource variables and risk variables	Cross-sectional study / t tests, Pearson Product Moment Correlation coefficients and chi square statistics	Exposure to the United States in childhood, a poor sense of mastery, and dissatisfaction with life were more related to depressive symptom experience than childbearing status or more traditional demographic variables such as age, income, or education.
GHQ-12	Area-level characteristics (classification of wards and population density)	Prospective multilevel cohort study / Multiple logistic regression	Rural residents had slightly better mental health than non-rural counterparts. The effects of geographical location on the mental health of participants were neither significantly confounded nor modified by socio-economic status, employment status or household income.
CES-D	Stressors and social factors	Six waves of a nationally representative cohort survey / Growth curve analysis	Women's disadvantage with respect to social position and employment accounted for about 40% of the sex difference in depressive symptoms. Sex differences in decision control, exposure to widowhood and financial decline played surprisingly little role. No evidence was found that the effects of marriage, recent widowhood or recent child death varied by sex, but living apart from one's children appeared to be more detrimental for women than for men. Living with an unmarried son was more strongly associated with depressive symptoms than living with a married son and daughter-in-law.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Hamad et al., 2008	To characterize prevalence and correlates of depressive symptoms and perceived stress among a heterogeneous South African population.	n=257 (low-income adults)	South Africa, Capetown, Port Elizabeth and Durban; September-November 2004	Depressive symptoms
Skapinakis et al., 2006	To investigate the longitudinal association between socio-economic position and common mental disorders in a general population sample in the UK.	n=2,406	UK; 2000 and 18 months later	Common mental disorders
Liu & Chen, 2006	To examine the independent and interactive effects of marital conflict and marital disruption on women's depressive affect and how these effects vary by family's poverty status.	n=2,254	US; National Longitudinal Survey of Youth; 1992, 1993, and 1994	Depressive affect
McKinnon et al., 2013	To examine whether older adults who may be lacking adequate support through living alone or in skipped-generation households are at an increased risk of depressive symptoms compared to those living with at least one working-age adult.	n=12,647 (aged +50)	2002-2003 World Health Surveys for 15 countries in sub-Saharan Africa (Burkina Faso, Chad, Congo, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mali, Namibia, Senegal, South Africa, Swaziland, Zambia, and Zimbabwe)	Depressive symptoms
Galea et al., 2005	To assess the relations between characteristics of the neighbourhood internal and external built environment and past six month and lifetime depression.	n=1,355	US, New York City; 2002	Depression
Galea et al., 2007	To assess the relation between urban neighborhood poverty and incident depression.	n=1,120	US, New York City; 2002, 6 and 18 months after	Major depression
Matheson et al., 2006	To answer the following questions: 1) Is neighborhood stress correlated with higher risk of depression? 2) To what extent does chronic stress account for neighborhood variation in depression? 3) Does the association of neighborhood chronic stress remain after controlling for individual characteristics, neighborhood ethnic diversity and dependency? 4) Is neighborhood chronic stress associated with gender differences in depression?	n=56,428	Canada, Metropolitan Areas; Canadian Community Health Survey; 2000–2001 and 2003–2004	Depression
Clark et al., 2007	To examine the prevalence and psychological correlates of witnessing community violence among women of low socioeconomic status living in urban neighborhoods.	n=386	US; November 1996-December 1998	Anxiety and depressive symptoms
Diwan, 2008	To examine differences in social network characteristics and their relationship to depressive symptoms among two groups of older Asian Indian immigrants: those with limited English proficiency and those proficient in English.	n=340 (226 English-speaking and 114 Gujarati-speaking Asian Indian immigrants)	US, Atlanta; 1999–2000	Depressive symptoms
Tannous et al., 2008	To investigate the prevalence of postnatal depression in women residing in Southern Brazil and the associated risk factors.	n=271	Brazil, Porto Alegre; Record of Living Newborn Infants of the State Health Department; June 2001	Depressive symptoms
Cooper et al., 2013	To test the hypothesis that pre-/postrelocation improvements in local economic conditions, social disorder, and perceived community violence are associated with declines in depressive symptoms in a cohort of African-American adults.	n=172	US, Atlanta; 2008 and 2010	Depressive symptoms

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
CES-D	Demographics, socio-economic status, subjective social status, major life events, household decision-making	Cross-sectional study / Multivariate regressions	Increased CES-D scores were associated with more household members ($p<0.1$), lower educational attainment ($p=0.07$), less income stability ($p<0.07$), lower subjective social status ($p<0.01$) and independent decision-making ($p=0.04$).
Revised Clinical Interview Schedule	Socio-economic position	Longitudinal study / Logistic regression analysis	None of the socio-economic indicators studied was significantly associated with an episode of common mental disorder at follow-up after adjusting for baseline psychiatric morbidity.The analysis of separate diagnostic categories showed that subjective financial difficulties at baseline were independently associated with depression at follow-up in both cohorts.
CES-D	Marital conflict, marital disruption and poverty status	Three waves of a national longitudinal study / OLS regression	The results showed that marital conflict and marital disruption each predicts subsequent depression after controlling for the initial level of depression and other antecedent variables. The effect of marital conflict on depression is stronger among women in poverty than those out of poverty. Furthermore, among women in poverty, marital conflict followed by marital breakup is related to a heightened level of depression, whereas among women financially better off, there is a reduction in the level of depressive affect.
CIDI	Living arrangements	Cross-sectional, cross-nationally comparable surveys / Logistic regression	Older adults living alone had a 2.3% point higher predicted prevalence of depressive symptoms compared to individuals living with at least one working-age adult (95% CI 0.2%, 4.4%). None of the country characteristics examined explained heterogeneity across countries in the relationship between living arrangements and depressive symptoms. However, there was some evidence suggesting a positive association between depressive symptom prevalence and the severity of a country's HIV/AIDS epidemic.
National women's study (NWS) depression module	Characteristics of the built environment	Cross-sectional survey / Multilevel models; simple linear models	Residence in neighbourhoods characterised by a poor quality built environment was associated with greater individual likelihood of past six month and lifetime depression adjusting for age, race/ethnicity, sex, and income and for neighbourhood level income. In adjusted models, persons living in neighbourhoods characterised by poorer features of the built environment were 29%–58% more likely to report past six month depression and 36%–64% more likely to report lifetime depression than respondents living in neighbourhoods characterised by better features of the built environment.
SCID	Neighborhood socioeconomic status	Population-based prospective cohort study / Multivariable models	In low–socioeconomic status neighborhoods, the cumulative incidence of depression was 19.4 per hundred persons (95% CI 13.5, 25.3), which was greater than that in high-SES neighborhoods (10.5; 95% CI 5.9, 15.2). In multivariable models adjusting for individual covariates, the relative odds of incident depression was 2.19 (95% CI 1.04, 4.59) for participants living in low-SES compared with high-SES neighborhoods.
CIDI-SF MD	Neighborhood chronic stress (residential mobility and material deprivation) and population structure (ethnic diversity and dependency)	Two cyles of a cross-sectional nationally representative survey / Multilevel logistic regression	Residents of "stressed" neighborhoods had higher levels of depression than residents of less "stressed" neighborhoods. After adjustment for individual-level gender, age, education, marital and visible minority status and neighborhood-level ethnic diversity and dependency, a significant contextual effect of neighborhood chronic stress survived. As such, the daily stress of living in a neighborhood where residential mobility ($OR=1.04$, $p\leq0.05$) and material deprivation ($OR=1.05$, $p\leq0.01$) prevail was associated with depression. A random variation in depression by gender across neighborhoods was not found.
BSI	Adult community violence exposure	Longitudinal cohort study / Logistic regression	Controlling for marital status, educational attainment, age, and intimate partner violence victimization, women who witnessed violent acts in their neighborhoods were twice as likely to experience depressive and anxiety symptoms compared to women who did not witness community violence ($OR=2.6$, 95% CI 1.4, 4.9). Central American-born women had particularly high exposures.
CES-D	Patterns of social integration	Cross-sectional comparative study / Regression analysis	The samples differed significantly in demographics and patterns of social integration. Rates of depressive symptoms did not differ, and network composition was unrelated to symptoms. For both samples, poorer health and a more traditional ethnic identity were related to depressive symptoms. Quality of relationship with children was predictive of symptoms for Sample 2.
EPDS	Socio-demographic variables	Population-based cross-sectional study / Multivariate analysis	After adjusting for confounding variables, per capita income was found to have a significant association with PND.
CES-D	Neighborhood socioeconomic conditions	Longitudinal cohort study / Multilevel models	Between waves 1 and 2, participants experienced significant improvements in reported depressive symptoms and perceived community violence and in tract-level economic disadvantage and social disorder; these reductions were sustained across waves 2–4. A 1 standard deviation improvement in economic conditions was associated with a 1-unit reduction in CES-D scores; the magnitude of this relationship did not vary by baseline substance misuse or gender. Reduced perceived community violence also predicted lower CES-D scores. Our objective measure of social disorder was unrelated to depressive symptoms.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Coast et al., 2012	To systematically map, assess and aggregate research relating to postnatal depression (PND) and poverty in low and lower middle income countries (LLMICs).	Studies on postnatal depression and poverty from countries defined as low or lower middle income countries	Studies published after 1989 until August 2010	Postnatal depression
O'Reilly et al., 2008	To determine if area factors are independently related to suicide risk after adjustment for individual and family characteristics.	n=1,116,748 non-institutionalised individuals aged 16–74	Northern Ireland; 2001 to 2006	Suicide
Pearce et al., 2007	To examine whether geographical inequalities in suicide rates among men in this age group rose during the period 1980 –2001 in New Zealand.	Suicide for men aged 15–44	New Zealand; 1980-2001	Suicide
Miller et al., 2005	To assess the relationship between income inequality and suicide.	All fatal injuries in 1996, aged 15–64	New York City, US; 1996	All-cause of death
Kim et al., 2010	To document socioeconomic inequalities in self-destructive behaviors including suicidal ideation, para-suicide, and completed suicide.	A total of 15,812 and 7,443 suicides among men and women aged +14	South Korea; 1995 to 2005	Suicide
Karlović et al., 2005	To analyze eventual differences in characteristic of suicide between two areas of the Republic of Croatia, mediterranean and continental, according to several variables.	All suicide deaths, n=11,359	Republic of Croatia; 1993–2003	Suicide
Kposowa et al., 2008	To assess the impact of immigration on suicide	Data on suicides, n=719	US, Riverside County, California; 1998 to 2001	Suicide
Modrek et al., 2011	To examine the relation between inequality and mortality in the context of Costa Rica.	Cause-specific mortality data	Costa Rica; 1995 to 2005	All-cause of death
Blakely et al., 2006	To test the association of neighbourhood-level volunteerism with mortality.	2.31 and 2.44 million person years of follow-up aged 25–74 years; 16,446 and 10,398 male and female deaths	New Zealand; 1996	All-cause of death
Torresani et al., 2014	To describe the characteristics of elderly suicide victims in different residential settings compared to young suicide victims.	Suicide data, 2000-2009; n=525	Italy, South Tyrol; 2000-2009	Suicide

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
PubMed, Medline, Popline, Embase, ASSIA, PAIS, EconLit, ISI Web of Knowl- edge, CAB Direct, PsycInfo, IBSS, GeoBase	Poverty	Systematic mapping / Systematic search strategy	The research base on the relationships between poverty and PND in LLMIC is limited, but has recently expanded. It is dominated by studies that consider whether poverty is a risk factor for PND. Income, socio-economic status and education are all inconsistent risk factors for PND. Clues to better ways of framing and capturing economic stress in PND research is found in the qualitative studies included in our mapping. Evidence focusses overwhelmingly on individual-level analyses. To understand the scale and implications of PND in LLMICs, research has to take account of neighbourhoods, communities, and localities.
Northern Ireland Statistics and Research Agency	Individual, household and area characteristics	Longitudinal record linkage study / Cox proportional hazards modelling	Suicide risks were lowest for women (HR=0.30, 95% CI 0.24, 0.37, p<0.001) and for those who were married or cohabiting. Indicators of individual and household disadvantage and economic and health status at the time of the census were also strongly related to risk of suicide. The higher rates of suicide in the more deprived and socially fragmented areas disappeared after adjustment for individual and household factors. There was no significant relationship between population density and risk of suicide.
Ministry of Health	Area deprivation	Longitudinal registry-based study / Standardized rates and ratios	Age-standardized rates of suicide among men aged 15− 44 increased in all but two DHBs between 1980 and 2001. The ratio of inequality in suicide between the least deprived and most deprived areas of New Zealand rose from 1.68 in 1980−1982 to a high of 1.94 in 1990−1992, followed by a small reduction to 1.86 by the end of the study period.
New York City Office of the Chief Medical Examiner	Income inequality	Case-control study / Multilevel models	Suicide decedents were more likely than accident controls to reside in neighborhoods with greater income inequality even after controlling for individual characteristics; this relation was modified by age with an effect overall and among decedents aged 15-34 but not among decedents 35-64.
National Death Registration records	Educational attainment (at the individual level) and area-level characteristics (level of deprivation and degree of urbanicity)	Ecological study / Multiple correspondence analysis; linear trends	Completed suicides increased over time (20.9–42.8 per 100,000 for men and 8.9–20.9 for women). The most prominent increases in completed suicides were observed among the elderly in both genders. Lower education, rural residence, and area deprivation was each associated with higher suicide rates. Both absolute as well as relative inequalities in suicide by socioeconomic position widened over time.
Suicide register of the Ministry of Interior, and Croatian Bureau of Statistic	Suicidal rates, season, month, day, method, places, socioeconomic variables (gender, age, marital status, employment, education), and psychiatric or medical characteristic	Registry-based study / Poisson regression model	The average suicide rate in the Mediterranean area was lower (16.44 suicides per year) than in continental area of Croatia (26.34 suicides per year). In the Mediterranean area suicide committers were statistically significantly younger, and had higher education than suicide committers in the continental area of Croatia. Alcohol dependence, family conflicts, and medical disorders were more often present as suicidal motive in suicide committers in continental area of Croatia than in the Mediterranean area where undefined and unknown reason of suicide is present in majority of suicide cases.
Riverside County Coroner=Public Administrator Office	Immigration status	Unmatched case-control design / Logistic regression models	Immigration increased suicide risk. Immigrant divorced persons were over 2 times more likely to commit suicide than natives. Single immigrants were nearly 2.6 times more likely to kill themselves than the native born. Shorter duration of residence was associated with higher suicide risk.
Vital Statistics Registry	Income inequality	Longitudinal national study / Multivariable Poisson models	For those aged 15–60, results indicate that there is a marginal adverse relation between increases in lagged inequality and mortality from suicide (IRR=1.13, CI 0.99, 1.29). For those aged 60 and over, there is a limited evidence of a relation between inequality and health.
Statistics New Zealand	Neighbourhood social capital (volunteering activities for all census respondents) and neighbourhood deprivation	National multilevel cohort study / Multilevel Poisson regression analyses	Adjusting for just age and marital status, the mortality rate ratios for people living in the quintile of neighbourhoods with the lowest compared with highest volunteerism were 1.16 (95% CI 1.08, 1.24) and 1.09 (1.01, 1.18), for males and females, respectively. Adjusting for potential individual-level and neighbourhood-level socioeconomic confounders reduced the rate ratios to 0.94 (0.88, 1.01) and 0.92 (0.85, 1.01), respectively. There was no significant association with any cause of death, including suicide [rate ratios 0.89 (0.64, 1.22) and 0.57 (0.31, 1.05), respectively]. Restricting the analyses to only those census respondents living at their census night address for five or more years, and therefore 'exposed' to that level of volunteerism for a longer period, did not substantially alter findings.
Provincial Mortality Register	Sociodemographic characteristics, recent life events, family history of psychiatric morbidity and suicidal behaviour, psychiatric or somatic morbidity and previous attempted suicides	Psychological autopsy study / Multivariable analyses	About one-third of the suicides occurred in those aged 60 years and over. Suicide in the elderly was associated with low education level (OR=7.1, p<0.001), living in a one-person household (OR=2.4, p<0.01), not having economic troubles (OR=6.1, p<0.01), having seen a doctor in the past month (OR=2.4, p<0.01) and living in a residential facility (OR=2.6, p<0.05). Twenty-four (17.9%) suicide victims aged 60 years and over were in a residential facility/hospital at the time of the death. They were more likely to be women, not married.

Table 1. Studies which examined the association between mental health and sociodemographic and economic factors at individual and at area-level (continuation)

Author, Year	Objective	Sample	Location; study; follow-up period	Outcome variable
Searles et al., 2014	To characterize the demographic, socioeconomic, and mental health features of individual suicide decedents by urban–rural residence status.	Suicide data in 16 states, 2006–2008	US; 2006–2008	Suicide
Middleton et al., 2006	To investigate the spatial patterning and possible contributors to the geographical distribution of suicide among 15–44-year-old men.	Suicide and undetermined mortality data among men aged 15–44; 1988–94	England and Wales; 1988–94	Suicide and undetermined deaths

and cognitive health of older adults. Another study[24] provided little support for social causation in neighbourhood health associations and suggested that correlations between neighbourhoods and health may develop via selective residential mobility.

We found one systematic review on the associations between ethnic density and mental disorders[25]. The "ethnic density hypothesis" is a proposition that members of ethnic minority groups may have better mental health when they live in areas with higher proportions of people of the same ethnicity. Shaw *et al.*[25] concluded that protective associations between ethnic density and diagnosis of mental disorders were most consistent in older US ecological studies of admission rates. Among more recent multilevel studies, there was some evidence of ethnic density being protective against depression and anxiety for African American people and Hispanic adults in the USA. However, Hispanic, Asian-American and Canadian "visible minority" adolescents have higher levels of depression at higher ethnic densities. Studies in the UK showed mixed results, with evidence for protective associations most consistent for psychoses.

- Social environment

Social capital is defined as the resources available to individuals and to society through social relationships[26], "the features of social organization, such as civic participation, norms of reciprocity, and trust in others, that facilitate cooperation for mutual benefit"[27].

Some of the empirical studies reviewed assessed the association between social capital and mental health. Social capital may affect mental health in different ways, through its "structural" (connectedness, membership of organisations) or "cognitive" (trust, sense of belonging, and shared values) components. High levels of structural social capital[28-31] and high levels of cognitive social capital[18,30] were associated with lower risk of mental health distress or disorder after taking into account potential individual confounders. People who reported fewer neighbourhood problems had higher levels of mental wellbeing, independently of individual factors[18]. The perception of severe problems in the community[28,32], exposure to violence and negative life events[33], and high frequency levels of discrimination[34] were associated with higher levels of psycho-

Mental health instrument/Source of data	Determinant measured	Study design / Statistical methods	Results
National Violent Death Reporting System	Decedent demographic and social characteristics, mental health history and specific details of individual suicides	Individual-level study / Logistic regression analysis	Of 17,504 analyzed suicides, 78% were in urban, 15% in rural adjacent, and 8% in rural nonadjacent locations. Rural decedents were less likely than urban decedents to have a mental health diagnosis or mental health care, although the prevalence of depressed moods appeared similar.
Office for National Statistics	Social, economic and health characteristics of areas, and rurality indices	Geographic distribution / Random-effects Poisson regression models	Two main patterns emerged: (a) in all of the 10 most densely populated cities studied, suicide showed a ''bull's-eye'' pattern with rates highest in the inner-city areas and, in some cases, low rates in the peripheries, and (b) suicide rates were high in coastal areas, particularly those in more remote regions. Possible indicators of social fragmentation, such as the proportion of single-person households in an area, were most strongly and consistently associated with rates of suicide in both urban and rural areas. Levels of unemployment and long-term illness accounted for some of the coastal patterning. Although characteristics of areas accounted for more than half of the observed variability, substantial between-area variability in rates remained unexplained.

logical distress. Perceived neighbourhood satisfaction[35] and stress-buffering mechanisms in the neighbourhood[33] were associated with a lower likelihood of disorders. Higher workplace social capital was associated with lower odds of poor mental health in a study among Chinese employees[36].

Physical environment / geographical location

Higher neighbourhood average household occupancy and churches per capita were associated with a lower likelihood of disorders[33]. Factors such as noise, air quality, low quality of drinking water, crime and/or violence, rubbish and traffic congestion were associated with worst mental health across Europe[37]. Architectural features of the front entrance such as porches that promote visibility from a building's exterior were positively associated with perceived social support, which in turn was associated with reduced psychological distress after controlling for demographics[38]. In a longitudinal study, neighbourhood residential instability was associated with higher levels of alcoholic and depressive symptomatology in women[39].

Review of studies on the social determinants of common mental disorders

We grouped in this category 94 studies whose outcome was assessed using a validated screening or diagnostic instrument allowing a common mental disorder (depressive or anxiety disorder) diagnosis to be made. The size of the samples ranged between n = 112 and n = 237,469. Sixteen studies were conducted in Europe, 52 in North America, 7 in South America, 4 in Africa, 10 in Asia, 2 in Australia, and one in multiple continents. Two of the studies were systematic reviews. Most of the studies used the CES-D (41), and others used the CIDI (8), the GDS-30 (8), the GHQ (5), the BDI (3), or the HADS (3), among other mental health instruments. Almost all the studies performed multivariable statistical analysis, with adjustment for covariates, and some of them used multilevel models.

Individual demographic and socioeconomic factors

We found a systematic mapping of research on postnatal depression and poverty in low- and lower middle-income countries[40]. The authors state that research is limited, but has recently expanded, and that it is dominated by studies that consider whether poverty is a risk factor for postnatal depression. They found that income, socio-economic status and education are all inconsistent risk factors for postnatal depression. Coast *et al*.[40] argue that to understand the scale and implications of postnatal depression in low- and lower middle-income countries research has to take into account neighbourhoods, communities, and localities.

Several cross-sectional studies assessed which individual demographic and socioeconomic factors were associated with an increased prevalence of common mental disorders. Female gender[41-48], not being married[41,42,44,46,48-52], being married[45], higher age[42,52], household food insufficiency[53,54], less favourable housing condition[54,55], low social position[43,56], lower education[56-58], unemployment[52,58-60], low income[42,44,45,49,52,55,57,58,61-64], financial strain[49], less income stability[56], negative subjective health[48,52,59,62], lower overall health status[42], having functional impairment[62], rural residency[47,52,65], no religiosity[52], lower social stability[66], being a victim of sexual violence[59], psychological violence during childhood[59], lack of support network[49,59,61,67,68], poorer quality of life[42], perceived discrimination (racial or other)[54,69], perceived stress[58], a poor sense of mastery/control[63,70], and feeling more lonely[47,55] were variables that remained significantly associated with an increased prevalence of common mental disorders after adjustments. St John *et al*.[62] found no rural-urban differences associated with depressive symptoms. Depression is a severe problem in the unemployed population, particularly among the long-term unemployed[60]. In a population-based register study in Finland, among those with no previous inpatient or antidepressant treatment, all measures of low social position and not living with a partner predicted admission for depression[71].

Some cross-sectional studies focused specifically in identifying protective and risk factors associated with common mental disorders in immigrants. Two studies conducted in the US compared native-born and immigrant groups: the first found that, controlling for other predictors, the likelihood of depression was much higher among black women who were US born than among black women who were African born or Caribbean born[72], and the second showed that a native-born Mexican American group was not significantly different from an immigrant group on measures of depression, health status, life satisfaction, or self-esteem[73]. Another study, conducted among Gujarati-speaking immigrants in Atlanta[74], concluded that poorer health and a more traditional ethnic identity were related to depressive symptoms.

In prospective studies the following factors were independently associated with higher rates of common mental disorders: female gender[75], socioeconomic disadvantage[76], low level of education[75], lower subjective social status[77], mortgage delinquency[78], home foreclosure[79], financial strain[80], marital conflict and marital disruption[81], and perceived discrimination[82-84]. Depressed individuals with low socioeconomic status appear disproportionately likely to experience multiple risk factors of long-term depression[85]. In one study, only subjective financial difficulties at baseline were independently associated with depression at follow-up, supporting the view that apart from objective measures of socio-economic position, more subjective measures might be equally important from an aetiological or clinical perspective[86].

A study in the US suggested that the rise in the prevalence of depression in the prior quarter century among middle-aged females is due to increasing chronicity[87]. Another study suggests that the causal relationship hypothesized in prior studies –that perceived social position affects health– does not necessarily hold in empirical models of reciprocal relationships[88]. Higher SES prior to job loss is not uniformly associated with fewer depressive symptoms: higher education and lower prestige appear to buffer the health impacts of job loss, while financial indicators do not[89].

Neighbourhood characteristics

We found a systematic review of the published literature on the associations between neighbourhood characteristics (neighbourhood socioeconomic status, physical conditions, services/amenities, social capital, social disorder) and depression in adults[90]. Evidence generally supports harmful effects of social disorder and, to a lesser extent, suggests protective effects for neighbourhood socioeconomic status. Few investigations have explored the relations for neighbourhood physical conditions, services/amenities, and social capital, and less consistently point to salutary effects. Kim[90] argues that the unsupportive findings may be attributed to the lack of representative studies within and across societies or to methodological gaps, including lack of control for other neighbourhood/non-neighbourhood exposures and lack of implementation of more rigorous methodological approaches.

Socioeconomic composition

Some cross-sectional studies suggest that neighbourhood low-SES[49,91], material deprivation[92,93], living in an area with high unemployment[94], residential mobility[92], residential stability[95], higher population density[96], urban neighbourhoods[97], perceived traffic stress[98], neighbourhood walkability[99], poor quality built environment[100,101], village infrastructure deficiency[102], neighbourhood violent crime and poorer perceptions of neighbourhood safety[103] are associated with increased depressive symptoms or depression, independent of individual level characteristics. However, other studies suggest that individual level characteristics explain away the association between neighbourhood level factors and depression[48,57,95,96,104]. Higher household income may help to reduce symptoms of depression by reducing financial stress and strengthening social support even within neighbourhoods with high concentrations of poverty, but it does not protect those residing in a high poverty community from distress associated with neighbourhood disorder or experiences of discrimination[105].

In an ecological study, the significant risk factors found for hospitalization included unemployment, poverty, physician supply, and hospital bed supply, and the significant protective factors were rurality, economic dependence, and housing stress[106].

Two cross-sectional studies included in this review[107,108] demonstrated that living in a neighbourhood with a higher percentage of residents of the same ethnicity was associated with depression.

Data from some prospective studies indicate socioeconomic status of neighbourhood of residence to be associated with incidence or worsening of depression independent of individual socioeconomic status and other individual covariates[109], while others did not support this association[110,111]. In multivariable models that adjusted for individual-level covariates, the neighbourhood characteristics shown to represent risk factors for common mental disorders were increases in neighbourhood-level foreclosure[112], eco-

nomic disadvantage/deprivation[113-116], exposure to neighbourhood unemployment earlier in life[117], perceived community violence[113], social disorder[114], and urban neighbourhoods[118]. In another study, living in a socially advantaged neighbourhood, with cultural services, near a park and having a local health service nearby were associated with lower risk of depression[119].

Some studies examined the impact of income inequality on mental health. One cross-sectional study found significant associations between neighbourhood inequality and depression[120], and another found higher depressive symptoms in countries with greater income inequality and with less individualistic cultures[63], independently of individual level effects. A longitudinal study found that income inequality did not correlate significantly with the presence of depressive symptoms[115].

Social environment

Cross-sectional studies suggest that neighbourhood-level social capital[121,122] and its dimensions of availability and satisfaction with community services[102,123], high collective efficacy[124] and community participation[124] reduce the likelihood of depressive symptoms. One study found that major depression was not associated with social capital[125]. In an instance of the "dark side" of social capital, Takagi *et al.*[126] found that stronger social cohesion increased depressive symptoms for residents whose hometown of origin differed from the communities where they currently resided. Both neighbourhood disorder and community cohesion were related to PTSD symptoms after controlling for trauma exposure[127]. Life events mediate the relation between neighbourhood characteristics and depression[128]. Teychenne *et al.*[129] investigated the contribution of perceived neighbourhood factors in mediating the relationship between education and women's risk of depression, and they found that interpersonal trust was the only neighbourhood characteristic which partly mediated this relationship.

In the longitudinal studies reviewed, lower levels of social cohesion[130], of cognitive social capital[131], and of aesthetic quality[130], and higher levels of violence[130,132] were positively associated with incident depression. People who trusted their neighbours were less likely to develop major depression, but the association became non-significant after excluding participants with major depression at the baseline[131]. In another study, stronger perceived neighbourhood homogeneity was inversely associated with depressive mood, but, when participants who reported a depressive mood at baseline were excluded, stronger perceived heterogeneous network was inversely associated with depressive mood[133]. Both social support and neighbourhood collective efficacy moderated the effect of perceived discrimination on depressive symptoms[82].

Review of studies on the social determinants of suicide

In this category we included 22 studies. 10 of these studies were conducted in Europe, 3 in North America, 2 in South America, 4 in Asia, and 3 in Australia. The studies consisted of individual-level evidence (case-control or cohort studies) or aggregate (ecological) studies.

Individual demographic and socioeconomic factors

Individual-level evidence shows that risk factors for suicide are male gender[134], older age[134,135], being unmarried/divorced/widowed[136], low education[137-139], socio-economic disadvantage[138,140,141], unemployment[135], increasing levels of firearm availability[135],

and immigration[142]. In a study describing the characteristics of elderly suicide victims[139], suicide was associated with living in a one-person household (OR = 2.4, p < 0.01), not having economic troubles (OR = 6.1, p < 0.01), having seen a doctor in the past month (OR = 2.4, P < 0.01) and living in a residential facility (OR = 2.6, p < 0.05).

Neighbourhood characteristics

Some studies have shown associations between suicide rates and indices of area deprivation[137,143-145]. However, O'Reilly *et al.*[141] suggested that differences in rates of suicide between areas are predominantly due to population characteristics rather than to area-level factors.

Individual-level and population-based evidence suggested that low social capital[146,147], low linking social capital[148], unemployment rate[149], the proportion of indigenous population[149], the proportion of population with low individual income[149] and income inequality[150], particularly for those aged 15-60[151] were significantly and positively associated with suicide. Another study found no statistically significant independent association of a structural measure of neighbourhood social capital (volunteerism) with suicide[152].

In the studies reviewed on the geographical distribution, suicide rates were higher in rural areas[134,137,140]. In a study in the US, rural decedents were less likely to be receiving mental health care and more likely to use firearms to commit suicide[153]. A study in England and Wales[154] found higher rates of suicide in inner cities, but largely explained by the socioeconomic characteristics of these areas, and in coastal regions, particularly those in more remote regions. In Croatia, Karlovi *et al.*[155] found a higher average suicide rate in the continental area than in the Mediterranean area.

Discussion

Main findings

The systematic reviews included in this study showed a) mixed results on the associations between ethnic density and mental disorders, b) limited research on the association between poverty and postnatal depression in low- and lower middle-income countries, with inconsistent results, and c) support for the harmful effect of neighbourhood social disorder and, to a lesser extent, protective effect of neighbourhood socioeconomic status on depression.

This non-systematic narrative review documents a growing body of literature investigating the social determinants of mental health: 47 of the 150 studies included (31,3%) were published in 2013 and 2014, with only 17 (11,3%) of the studies published in 2004 and 2005, the two first years of this review.

Seventy-eight studies reported associations between individual-level factors and mental health. Given the large number of exposures considered in this review, some exposure-outcome pairs were examined by only a single study. The main factors shown to have a statistically significant independent association with worse mental health were low income (17 studies), marital status/not living with a partner (16 studies), lack of emotional/social support (10), female gender (9), low level of education (9), low socioeconomic status (7), unemployment (5), financial strain (5), perceived discrimination (5), negative subjective health (4), loneliness (4), low subjective social status (3), deteriorated housing (3), higher age (3) and negative life events (3). Level of education, parenthood, rural-urban differences, low socioeconomic position and race were not associated with mental health outcomes in one study for each determinant.

Sixty-nine studies reported associations between area-level factors and mental health, 23 focusing on social capital, 36 on neighbourhood socioeconomic conditions, 15 on geographical distribution and built environment, 9 on exposure to neighbourhood problems, and 2 on ethnic composition. The large majority (12 of 14-86%) of the studies assessing "structural" aspects of social capital found a statistically significant association between measures of low social capital and poor mental health. Ninety-two percent (12 of 13) of the studies assessing "cognitive" aspects of social capital found a statistically significant association between low social capital and poor mental health. Statistically significant positive associations were found in 24 (82.8%) of the 29 studies assessing the relationship between measures of neighbourhood economic disadvantage and psychological distress, depression and suicide. Income inequality was a risk factor for suicide in 2 studies, but results on the association with poor mental health and depression were conflicting. Unemployment rate emerged as a risk factor for poor mental health and suicide in 6 studies. Being exposed to neighbourhood problems was associated with higher levels of psychological distress, depression and suicide in 11 studies, while the presence of stress-buffering mechanisms was statistically significantly and negatively associated with mental disorders. Urban neighbourhoods were associated with depression in 4 studies, but rural areas were associated with higher suicide rates than urban areas in other 4 studies. Poor quality built environment also emerged as a risk factor for depression in 3 studies, while neighbourhood walkability and living near a park were protective factors.

Limitations

This review has some limitations, at review-level and at study- and outcome-level.

Literature search was limited to articles focusing on individual *and* contextual determinants, and this search strategy may have contributed to an incomplete retrieval of studies. Several exclusion criteria were established in order to reduce the heterogeneity of studies and to make it possible to extract some conclusions, and this further narrowed the studies included. We had no access to 31 of the 266 articles assessed for eligibility, and that was a reason for exclusion.

We included in the review the studies identified by the search strategy, but factors such as publication bias and selective reporting may contribute to a distorted perception of the results.

There was large heterogeneity between studies concerning study design and populations, determinants, outcome and instruments used. This heterogeneity only allows a few descriptive findings.

Future research direction

Further empirical studies on social inequalities in health are needed to make sense of the mixed research findings, to understand the pathways through which they influence health, and to find out ways of reducing their magnitude.

Two main mechanisms have been posited in understanding the link between mental illness and poor social circumstances: social causation and social selection. According to the social causation hypothesis, socioeconomic standing has a causal role in determining health or emotional problems. Social selection hypothesis posits that genetically predisposed individuals with worse physical or emotional health may "drift down" the socioeconomic hierarchy or fail to rise in socioeconomic standing as would be expected on the basis of familial origins or changes in societal affluence.

Longitudinal studies, with multiple time point measures, are much needed in the future to clarify the causal direction between social determinants and mental health.

The study of the associations between contextual SES and mental health also needs more powerful studies, using multilevel analyses and establishing mediating pathways and effect-modifying factors, in order to disentangle the individual effect from the neighbourhood effect on health.

Conclusion

The goal of this literature review was to identify the relevant published evidence on the associations between social determinants and mental health. These disorders are highly prevalent, have severe consequences, and it is particularly important to improve our understanding of modifiable risk factors that may help to advance preventive efforts.

For many decades, studies have shown that mental health is the complex outcome of numerous biological, psychological and social factors, involving contextual factors beyond the individual. Despite changes in concepts and methods used to define cases and measure socioeconomic status, the studies reviewed suggest that exposure to a wide range of social stressors continues to play an important role in the aetiology and the course of mental health problems and disorders. Higher rates of mental disorders are associated with social disadvantage, especially with low income, limited education, occupational status and financial strain. Lack of social support, high-demand or low control over work, critical life events, unemployment, adverse neighbourhood characteristics, and income inequality were also identified as psychosocial risks that increase the chances of poor mental health. Importantly, this review highlighted some important protective factors: having trust in people, feeling safe in the community, and having social reciprocity is associated with lower risk of mental health distress.

Our results suggest that both individuals and neighbourhoods need to be targeted in order to enhance mental health. Saraceno[156] argued that, in parallel to the classical biopsychosocial etiological hypothesis, an identical paradigm for mental health intervention is needed: "The social dimension of mental illness should be an intrinsic component of intervention and not just a concession in etiological modelling"[156]. In fact, the present review suggests that ameliorating the economic situation of individuals, enhancing community connectedness, and combating neighbourhood disadvantage and social isolation may improve population's mental health. These results may be relevant to healthcare providers and to policy makers, and should be taken into account when designing policies and interventions aimed at improving treatment services, preventing mental disorders, and promoting mental health in different communities.

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Declaration of interest

The authors report no conflicts of interests. The authors alone are responsible for the content and writing of the paper.

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