

Income inequality among American states and the incidence of major depression

Roman Pabayo,¹ Ichiro Kawachi,¹ Stephen E Gilman^{1,2,3}

► Additional material is published online only. To view please visit the journal online (<http://dx.doi.org/10.1136/jech-2013-203093>).

¹Department of Social and Behavioral Sciences, Harvard School of Public Health, Boston, Massachusetts, USA

²Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts, USA

³Department of Psychiatry, Massachusetts General Hospital, Boston, Massachusetts, USA

Correspondence to

Dr Roman Pabayo, Department of Social and Behavioral Sciences, Harvard School of Public Health, 677 Huntington Avenue, Boston, MA 02115, USA; rpabayo@hsph.harvard.edu

Received 11 July 2013

Revised 14 August 2013

Accepted 26 August 2013

Published Online First

24 September 2013

ABSTRACT

Background Although cross-sectional and ecological studies have shown that higher area-level income inequality is related to increased risk for depression, few longitudinal studies have been conducted. This investigation examines the relationship between state-level income inequality and major depression among adults participating in a population-based, representative longitudinal study.

Methods We used data from the National Epidemiologic Survey on Alcohol and Related Conditions (n=34 653). Respondents completed structured diagnostic interviews at baseline (2001–2002) and follow-up (2004–2005). Weighted multilevel modelling was used to determine if US state-level income inequality (measured by the Gini coefficient) was a significant predictor of depression at baseline and at follow-up, while controlling for individual-level and state-level covariates. We also repeated the longitudinal analyses, excluding those who had a history of depression or at baseline, in order to test whether income inequality was related to incident depression.

Results State-level inequality was associated with increased incidence of depression among women but not men. In comparison to women residing in states belonging to the lowest quintile of income inequality, women were at increased risk for depression in the second (OR=1.18, 95% CI 0.86 to 1.62), third (OR=1.22, 95% CI 0.91 to 1.62), fourth (OR=1.37, 95% CI 1.03 to 1.82) and fifth (OR=1.50, 95% CI 1.14 to 1.96) quintiles at follow-up (p<0.05 for the linear trend).

Conclusions Living in a state with higher income inequality increases the risk for the development of depression among women.

INTRODUCTION

An estimated 15% of US adults will experience a major depressive episode in their lifetime, and 5% of US adults will experience a major depressive episode in any given year.^{1 2} The prevalence of depression is disproportionately higher among individuals of lower socioeconomic status,³ whether defined by low educational attainment, low income or income below the poverty threshold.^{1 2}

Independent of an individual's own income level, the distribution of incomes in society has been hypothesised to influence the risk of depression.⁴ Pickett and Wilkinson⁴ argued that when the gap between the incomes of the rich and poor widens, it may heighten feelings of insecurity and shame among members of society who are left behind—known as the so-called 'psychosocial theory' of income inequality and health. Feelings of shame and failure may be particularly acute in a society such as

the USA where the majority—even the poor—believe that it is possible for everyone to achieve the 'American Dream', even though objective evidence indicates that social mobility in the American society is worse than in most other European countries.⁵ One consequence of the discrepancy between subjective beliefs/aspirations versus reality is that when individuals strive—and fail—to meet socioeconomic success, they often end up blaming themselves for their failure.⁶ Income inequality may also erode social cohesion,⁷ leading to the inadequate protection of the most vulnerable members of society (eg, the unemployed) and subsequently their increasing social exclusion and isolation. As a result, these feelings of exclusion and isolation might lead to depression.

Furthermore, previous research has indicated that the association between environment and health differs between men and women.^{8–12} In some cases, associations are stronger or are only observed among women.^{9 10 13} A possible explanation is that women are more susceptible to the erosion of social cohesion that stems from the income inequality resulting in a greater risk for depression.¹⁴ Also, women were more likely to have an unmet need for mental health treatment or counselling in comparison to men.¹⁵ Women might be more susceptible to a lack of mental health services within high-income inequality states.^{16 17}

With the exception of two studies,^{18 19} most empirical research investigating the relationship between income inequality and depression has identified income inequality as a significant predictor of depression.^{20–27} All these investigations were cross-sectional or ecological, with the exception of one small, occupational cohort study.²⁷ The weight of the evidence until now suggests that income inequality acts as a 'contextual influence' on the mental health of individuals, independently from the influences of personal socioeconomic characteristics.

Ecological studies have examined the association of income inequality between countries,²¹ US states²⁰ and US counties,²³ with the prevalence of depression. Ecological studies are susceptible to ecological fallacy while temporality cannot be identified using the cross-sectional study design. Of the studies that collected individual-level data, four used a nationally representative sample.^{18 19 25 26} One study utilised a representative sample of New York City²⁴ and another used a nationally representative random sample of women who had given birth in 1988.²² Most of the studies utilised a questionnaire such as the Center for Epidemiologic Studies Depression (CES-D) or the EURO-D scales to assess depressive symptoms.^{18 19 22–24 26 27} Only three studies^{20 21 25} utilised diagnostic measures to assess

To cite: Pabayo R, Kawachi I, Gilman SE. *J Epidemiol Community Health* 2014;**68**:110–115.

depression—in these studies, only two identified a significant relationship between income inequality and depression.^{20–21, 25} One study investigated associations among males and females separately,²⁵ though none tested inequality and sex interaction terms. One study tested inequality and race/ethnicity interaction terms.¹⁸ Therefore, longitudinal studies are needed to identify the temporal relationship between income inequality and depression, that is, income inequality occurs before an episode of depression.

The current study overcomes the limitations of existing research by using a longitudinal design, a population-based sample, a diagnostic assessment of depression and empirically evaluates sex and race/ethnicity differences in the association between income inequality and depression. In addition, it considers several possible explanations for the association between income inequality and depression: poor physical health,^{28–30} unemployment and other stressors^{31–34}; and a family history of depression.^{35–36} Each of these established risk factors for depression has been linked with income inequality.

METHODS

Sample

Data come from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a representative sample of non-institutionalised US adults aged 18 and older.^{37–38} The NESARC was carried out in 2001–2002 and included structured diagnostic interviews with 43 093 participants with an overall response rate of 81%. Interviews were conducted between 2004 and 2005 with 34 653 participants being followed up for a response rate of 86.7% of eligible participants. Participants provided written informed consent.

MEASURES

Area-level covariates

The main exposure of interest was state income inequality, which was measured using the Gini coefficient. The Gini coefficient theoretically ranges from 0 (perfect equality, where every household earns exactly the same income) to 1.0 (perfect inequality). Calculation of the Gini coefficient has been described elsewhere.³⁹ A formal definition of the Gini coefficient is that it represents one-half of the average difference in incomes between any two individuals randomly sampled from the distribution, normalised on mean income.

In the current analysis, the Gini coefficient at 2000 in each of the 50 states and the District of Columbia was utilised using information collected from the US Census (<http://www.census.gov>). We used the distribution of the Gini coefficients to categorise the states into first (Gini \leq 0.421), second (Gini = 0.422–0.435), third (Gini = 0.436–0.445), fourth (Gini = 0.446–0.454) and fifth (Gini > 0.454) quintiles. Additional state-level covariates analysed to account for state-level compositional effects were median income, proportion of the US state in poverty, proportion of the US state that is African-American, population size and census division ((1) New England (reference category), (2) Middle Atlantic, (3) East North Central, (4) West North Central, (5) South Atlantic, (6) East South Central, (7) West South Central, (8) Mountain and (9) Pacific). The metropolitan statistical area (MSA) was used to determine the type of geographical setting in which the respondent lived at baseline. The setting was defined as urban (within the central city of the MSA), suburban (within the MSA but not within the central city) and rural (not in the MSA).

Individual-level covariates

At baseline, trained interviewers collected sociodemographic data, which included sex, age, total household income in the last 12 months, race/ethnicity, education and marital status. History of depression of the biological mother and father was asked via a questionnaire. Previous major depression within 12 months prior to baseline assessment was also collected. The occurrence of 11 past-year life events, such as death of a family member or friend and if the respondent was fired or laid off, was also included in the analyses. Perception of the respondent's health was asked using the question, 'In general, would you say your health is excellent, very good, good, fair or poor?' Responses were dichotomised into excellent, very good and good, versus fair or poor.

Outcome measure

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) psychiatric disorders were assessed by the Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV.⁴⁰ We focused on episodes of major depressive disorder that occurred between the baseline and follow-up interviews. Participants were assessed whether or not they experienced an episode of depression since the last interview.

Statistical analyses

We used multilevel logistic regression to investigate the prospective association between state-level income inequality and depression, adjusted for the area-level covariates. To investigate the association between income inequality at baseline and depression during the follow-up period, we fitted the following sequence of models. The first set of analyses involved estimating a state-level intercept-only model, which provides the 95% plausible value range of the degree of variability between states in risk of depression. The next model introduced income inequality as a state-level fixed effect. Then, individual-level and neighbourhood-level sociodemographics were added to the model. Next, a cross-level sex \times state-level income inequality interaction was included in the previous model. Finally, other covariates, such as marital status, perception of healthcare status and family history of depression, and life events, such as death of a family member or friend, were included in the model to evaluate the extent to which these factors could explain the association between income inequality and depression. Cross-level household income \times state-level income inequality and race \times state-level income inequality interactions were tested to determine if the association of income inequality differed by level of income and racial group. We analysed data from all participants of the NESARC follow-up interview, and then repeated the analyses among participants without any history of depression at baseline, which allowed us to generate ORs for incident depression.

For all analyses, multilevel modelling was used to account for the clustering within primary sampling units (PSU) and within the US states. In other words, the intercepts of state and PSU covariates were allowed to vary. The NESARC's Wave 2 sampling weights were incorporated into the analyses, which account for selection probabilities, participant non-response across both waves and poststratify the sample according to the demographics of the US population in 2000. Analyses were performed using Stata (V.12.0) and HLM 6.04 (Hierarchical Linear Modeling, Scientific Software International, Chicago, Illinois, USA).

RESULTS

Characteristics measured at baseline of the 34 653 adults participating in the NESARC are presented in table 1. Slightly over half the sample was female (52.1%). Approximately 70.9%

Table 1 Baseline characteristics of participants in the National Epidemiologic Survey on Alcohol and Related Conditions (n=34 653) (2001/2002)

	Unweighted, n	Weighted percentage
Sex		
Male	14 564	47.9
Female	20 089	52.1
Age, years		
18–30	7405	23.7
30–40	7438	20.4
40–50	6931	20.2
50–60	5313	15.2
60–70	3719	10.2
70–80	2787	7.5
80–90	993	2.5
>90	67	0.1
Racial background		
White	20 174	70.9
African-American	6577	11.0
Native	580	2.2
Asian	966	4.3
Hispanic	6356	11.6
Education		
Less than high school	5744	14.6
High school	9955	29.0
Postsecondary	14 863	44.1
Graduate school	4091	12.2
Marital status		
Couple	18 413	63.1
Single	16 240	36.9
Self-perceived health status		
Excellent, very good, good	29 126	86.2
Fair or poor	5527	13.8
Setting		
Urban	11 672	28.9
Suburban	16 400	50.6
Rural	6581	20.5
	Average	SD
Age, years	45.97	17.34
Household income, USD	9.84	4.82

were white and 28.9% were from urban regions. The average age was 45.08 years (SD=17.34).

Features of the five Gini quintile states are presented in table 2, and indicate the extent to which income inequality is systematically patterned by the demographic composition of states. For example, the mean proportion of residents who were African-American was 3.1% (SD=2.7), 9.1% (SD=9.8), 6.8% (SD=5.2), 17.9% (SD=11.6) and 17.4% (SD=18.2) in the first through the fifth Gini quintiles, respectively. Gini quintiles were significantly correlated with these attributes of states, but were not entirely redundant with them (correlation coefficients with median income, proportion African-American, proportion poor and state population were -0.26, 0.63, 0.60 and 0.35, respectively).

According to the intercept-only multilevel model for major depression, the prevalence of adults with a depressive episode ranged from 7.1% to 13.8% between states. This value is a measure of variability, similar to the Intraclass correlation (ICC), which was significant ($\chi^2=78.8$, $p=0.006$). The results of models for the association between income inequality and

Table 2 Characteristics of the five Gini Quintiles participating in the NSEARC study using data from the 2000 US Census

	GINI Q1 (n=10)			GINI Q2 (n=10)			GINI Q3 (n=11)			GINI Q4 (n=11)			GINI Q5 (n=9)			p Value					
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD						
Median income	43 715	44 112	5327	37 462–50 865	45 307	46 391	5367	35 349–51 695	39 214	42 024	6386	29 052–47 462	38 683	37 186.0	6261	31 528–51 032	40 864	39 842	6339	30 219–50 360	0.06
State population	2.8	2.5	2.0	0.6–6.1	3.4	1.6	3.6	0.5–11.4	4.4	3.4	3.7	0.8–12.3	5.8	5.1	3.2	0.9–12.4	11.8	6.3	11.3	0.6–33.9	<0.01
Proportion African-American	3.1	2.7	2.7	0.4–8.3	9.1	5.2	9.8	0.5–27.7	6.8	4.3	5.2	0.6–15.6	17.9	16.3	11.6	0.5–36.3	17.4	11.4	18.2	1.8–60.0	<0.01
Proportion in poverty	9.0	8.3	1.8	7.4–13.3	9.9	9.9	1.6	7.3–12.7	11.6	10.2	2.6	9.3–15.8	12.9	13.2	2.2	8.1–16.0	14.3	14.7	3.9	7.6–19.3	<0.01

Q1, first quintile; Q2; second quintile; Q3; third quintile; Q4, fourth quintile; Q5, fifth quintile.
*State population in million (United States Census, 2000).

depression during the follow-up period are presented in online supplementary table S1. In model 1, participants residing in the most unequal states were less likely to be depressed during follow-up. However, when demographic variables were added (model 2), income inequality was not significantly associated with depression. The cross-level interaction of state income inequality and sex was tested; women in the most unequal states were more likely to experience depression at follow-up (model 3). The cross-level interactions of state income inequality and household income and state income inequality and racial background were not significant, which indicates that state inequality did not have a differential association on the level of income or on the racial background (results not reported).

Other covariates were included in model 4. For example, after the life events, perception of health and paternal and maternal history of depression covariates were added, Gini quintiles were not significantly associated with depression during follow-up among men. However, again a significant cross-level income inequality and sex interaction (t -ratio=2.03, p =0.04) was found. For example, in comparison to women in the lowest Gini quintile, the risk for experiencing depression during follow-up was OR=1.18 (95% CI 0.86 to 1.62), OR=1.22 (95% CI 0.91 to 1.62), OR=1.37 (OR=1.03 to 1.82) and OR=1.50 (5% CI 1.14 to 1.96) for those in the second, third, fourth and highest quintile of inequality, respectively. Moreover, this relationship proved to be a significant linear trend as the estimated proportion of women who experienced a depression during follow-up increased as the level of state-level inequality increased (p =0.02).

Incidence of depression

The 95% plausible value range showed that the prevalence of adults experiencing an episode of depression at follow-up across the states ranged from 5.9% to 10.0%. Further analyses of incident depression are presented in online supplementary table S2. In model 1, there was no significant association between state-inequality and depression. Similar results were obtained when demographics and covariates were included in the model. However, when effect modification by sex was tested (t =2.01, p =0.045), in comparison to women living in the most equal states, those in the fourth quintile (OR=1.41, 95% CI 1.01 to 1.95) and fifth quintile (OR=1.37, 95% CI 1.01 to 1.88) were more likely to be depressed at follow-up (model 4). The cross-level interactions of state inequality on income and racial background for the risk of depression were not significant.

DISCUSSION

This current study is one of the first to investigate the prospective association between area-level income inequality and depression in a representative sample of the US population using individual diagnostic assessments. A previous ecological study based in the USA observed a significant relationship between high inequality and state prevalence of depression even after controlling for state-level confounders.¹⁰ Other researchers have observed a similar trend among nations.¹¹ Similar findings were found with multilevel studies using a cross-sectional design. For example, among Americans aged 70 and older, those living in counties with higher income inequality were more depressed, independent of demographic characteristics and physical health.¹³ Also, women from low Socioeconomic Status (SES) backgrounds living in high-income unequal states were more likely to experience depressive symptoms.¹² Our results indicate that area-level income inequality might be a predictor of incident depression among women.

Our results are at variance with a previous meta-analysis of studies of the association between inequality and health status, which found that income inequality is associated with mortality and other health outcomes in males and females.²⁸ We observed an association between state inequality and depression only among women. Women's mental health status might be more susceptible to state-level income inequality. To our knowledge, the only study that investigated a potential differential association of inequality on depression among adults yielded non-significant results among women and men.²⁵ A possible reason for the insignificant findings is the timing when data were collected for this investigation. Gini coefficients were used in 1990 and individual-level data were collected in 1992. National income inequality has been increasing since 1975–2010 from 0.30 to 0.38.³⁴ In fact, one of the steepest increases occurred between 1990 and 1992.³⁴ The length of exposure of income inequality could possibly take several years in order to have an observable significant association with the mental health of women.

Nonetheless, other studies have identified state policies and characteristics as affecting women's mental health status.^{41–45} Women living in states with high state-level women's status scores (characterised by women's political participation, economic autonomy, employment and earnings and reproductive rights) have been shown to have lower CES-D scores,⁴¹ and those who live within states with low women's status scores were more likely to report poor health.⁴² Other researchers have observed a significantly lower prevalence of depression among women living in states with greater reproductive rights in comparison to states with limited rights.⁴⁵ Other studies have shown significant relationships between women's status and other health outcomes such as mortality⁴³ and lower percentage of low birthweight babies.⁴⁴ Therefore, the consequences and potential benefits of state-level policies and characteristics might influence the health of women, but not men.

The distribution of income in a society has been theorised to be associated with population health, including poor mental health.⁴⁶ Several reasons for this association have been put forward. First, societies with higher levels of income inequality tend to have a greater number of people in poverty who lack access to resources (eg, mental health services). Economic disadvantage is itself a risk factor for depression. Hence, in a purely 'mechanical' sense, one would expect that income inequality correlates with worse mental health outcomes. However, this cannot be the sole explanation for the association between income inequality and poor health, since there appears to be a residual association between inequality and worse individual health outcomes, even after carefully controlling for individual socioeconomic status.

A second hypothesised reason for the relationship between income inequality and health is that when the gap between the rich and the poor widens, it tends to give rise to stressful social comparisons, that is, a growing sense of relative deprivation.⁴⁷ These invidious social comparisons could result in depression, especially when those at the bottom strive to 'keep up with the Joneses' but eventually realise that the American Dream is unattainable.⁴⁸ Indeed, recent economic data reveal that American median incomes have stagnated during the past three decades, and that social mobility has become rigidified to an extent that is far worse than most other western countries.⁵ As Stiglitz shows, there is a mismatch between American public perceptions about social mobility (the Horatio Alger myth) and the economic reality. Social theory suggests that when individuals strive under an illusion of equal opportunity and subsequently fail (because the playing field was never level to begin

with), then they will tend to blame themselves for their failure and consequently be at increased risk of depression.⁶ The theory of relative deprivation has been put to the test by examining the association between individual-level measures of deprivation (eg, the Yitzhaki index) and health outcomes. However, the theory of relative deprivation is also consistent with an observed association between area-level income inequality and individual health outcomes (eg, depression).

The third and last theory linking income inequality to health posits broad ‘pollution effects’ of inequality for society. As articulated by social epidemiologists, when income and wealth are concentrated at the top 1% (as has happened in the American society during the past three decades), their rent-seeking behaviour imposes a host of negative externalities on the rest of society.^{5 31 33} Social cohesion is eroded, while politics become distorted and legislation gets caught up in the race to disproportionately serve the interests of the wealthy. The most visible aspect of this dynamic is the strong push to lower taxes for the wealthy while imposing austerity on public spending (eg, education, public health and infrastructure). The result is a lower quality of life for the bottom 99%, which will manifest as an apparent ‘contextual’ effect of income inequality in lowering the health of the average resident—that is, even middle-class residents—of unequal societies.

These mechanisms by which income inequality could influence mental health suggest possible explanations for our findings that women exposed to high levels of inequality were more likely to experience an episode of depression. Numerous studies have identified social networks as a protective factor against depression, especially among women.¹⁴ The erosion of social cohesion might lead to a subsequent loss of social networks leading to a greater risk for depression. Women have been shown to be more responsive to social support than men.^{14 49 50} When faced with adversity, women tend to relieve stress by confiding in their peers, whereas men have been socialised to seek instrumental support.⁵¹ Furthermore, a lack of mental health services, such as counselling, might have a more negative effect on women than men.

This study’s results should be interpreted in the context of the following limitations. Data were not available on participants’ state of residence at the time of the follow-up interview; therefore, movement between baseline and follow-up is possible, which might result in differences between participants in the magnitude of exposure to state-level income inequality due to residential mobility during the follow-up period. Only two time points were collected, separated by 3 years. The influence of state income inequality on depression might be different over longer periods of time. Also, neighbourhood or county-level identifiers were not publicly released; therefore, if mechanisms linking income inequality to depression operate at the neighbourhood or county levels, they were not captured in our analyses, and our results may therefore underestimate the association between income inequality and depression.

In summary, this study has avoided the potential for ecological fallacy found in the ecological study design and also identified state-level income inequality as a predictor of depression. We investigated the prospective association between state-level income inequality and depression in a large national sample, and found that women living in more unequal states were significantly more likely to have a first-time depressive episode during 3 years of follow-up. We also investigated a wide range of potential explanatory factors for the association between income inequality and depression, although none of these factors proved to alter our results. Further investigation to

determine how income inequality leads to depression, such as the erosion of social cohesion and solidarity, especially among women, is warranted.

What is already known on this subject

- ▶ Depression disproportionately affects individuals of lower socioeconomic status backgrounds.
- ▶ However, income inequality has been shown to be an important risk factor for depression, but few longitudinal studies have been conducted.

What this study adds

- ▶ Among women only, those who lived in US states with high-income inequality were more likely to experience a major depressive episode at follow-up, in comparison to those living in more equal states.
- ▶ Similar results were obtained when the relationship between income inequality and incident depression was investigated.

Contributors RP conceived the research question, interpreted the results, drafted the article and provided final approval of the version to be published. IK guided the conception of the research question, provided input in the theoretical model, revised the article, gave critical important intellectual content and approved the final version. SEG conceived the research question, helped interpret the results, provided criticism and suggestions on how to shape the article, revised the article and gave final approval of the final version of the manuscript.

Funding This work was supported by NIH-grant number MH087544. RP is a Canadian Institutes of Health Research postdoctoral fellowship recipient #234617.

Ethics approval US Census Bureau and the US Office of Management and Budget.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Hasin DS, Goodwin RD, Stinson FS, *et al.* Epidemiology of major depressive disorder: results from the National Epidemiologic Survey on Alcoholism and Related Conditions. *Arch Gen Psychiatry* 2005;62:1097–106.
- 2 Kessler RC, Berglund P, Demler O, *et al.* The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA* 2003;289:3095–105.
- 3 Lorant V, Deliege D, Eaton W, *et al.* Socioeconomic inequalities in depression: a meta-analysis. *Am J Epidemiol* 2003;157:98–112.
- 4 Pickett KE, Wilkinson RG. *The spirit level: why greater equality makes societies stronger*. New York, NY: Bloomsbury Press, 2009.
- 5 Stiglitz JE. *The price of inequality: how today's divided society endangers our future*. New York City: WW Norton & Company, 2012.
- 6 Merton RK. *Social theory and social structure*. New York, NY: Free Press, 1968.
- 7 Kawachi I, Kennedy BP. Income inequality and health: pathways and mechanisms. *Health Serv Res* 1999;34:215–27.
- 8 Stafford M, Cummins S, Macintyre S, *et al.* Gender differences in the associations between health and neighbourhood environment. *Soc Sci Med* 2005;60:1681–92.
- 9 Shouls S, Congdon P, Curtis S. Modelling inequality in reported long term illness in the UK: combining individual and area characteristics. *J Epidemiol Community Health* 1996;50:366–76.
- 10 Diez-Roux AV, Nieto FJ, Muntaner C, *et al.* Neighborhood environments and coronary heart disease: a multilevel analysis. *Am J Epidemiol* 1997;146:48–63.
- 11 Smith GD, Hart C, Watt G, *et al.* Individual social class, area-based deprivation, cardiovascular disease risk factors, and mortality: the Renfrew and Paisley Study. *J Epidemiol Community Health* 1998;52:399–405.
- 12 Pickett KE, Pearl M. Multilevel analyses of neighbourhood socioeconomic context and health outcomes: a critical review. *J Epidemiol Community Health* 2001;55:111–22.

- 13 LeClere FB, Rogers RG, Peters K. Neighborhood social context and racial differences in women's heart disease mortality. *J Health Soc Behav* 1998;39:91–107.
- 14 Kawachi I, Berkman LF. Social ties and mental health. *J Urban Health* 2001;78:458–67.
- 15 U.S. Department of Health and Human Services. Substance Abuse and Mental Health Services Administration. Results from the 2009 National Survey on Drug Use and Health: Mental Health Findings (Center for Behavioral Health Statistics and Quality. In: Health NSoDUa, Rockville ed. MD: HHS Publication No. SMA 10-4609 ed. 2010;1–170.
- 16 Sturm R, Ringel JS, Andreyeva T. Geographic disparities in children's mental health care. *Pediatrics* 2003;112:e308.
- 17 Kim G, Parton JM, Decoster J, et al. Regional variation of racial disparities in mental health service use among older adults. *Gerontologist* 2013;53:618–26.
- 18 Zimmerman FJ, Bell JF. Income inequality and physical and mental health: testing associations consistent with proposed causal pathways. *J Epidemiol Community Health* 2006;60:513–21.
- 19 Shi L, Starfield B, Politzer R, et al. Primary care, self-rated health, and reductions in social disparities in health. *Health Serv Res* 2002;37:529–50.
- 20 Messias E, Eaton WW, Grooms AN. Economic grand rounds: income inequality and depression prevalence across the United States: an ecological study. *Psychiatr Serv* 2011;62:710–12.
- 21 Cifuentes M, Sembajwe G, Tak S, et al. The association of major depressive episodes with income inequality and the human development index. *Soc Sci Med* 2008;67:529–39.
- 22 Kahn RS, Wise PH, Kennedy BP, et al. State income inequality, household income, and maternal mental and physical health: cross sectional national survey. *BMJ* 2000;321:1311–15.
- 23 Muramatsu N. County-level income inequality and depression among older Americans. *Health Serv Res* 2003;38:1863–83.
- 24 Ahern J, Galea S. Social context and depression after a disaster: the role of income inequality. *J Epidemiol Community Health* 2006;60:766–70.
- 25 Henderson C, Liu X, Diez Roux AV, et al. The effects of US state income inequality and alcohol policies on symptoms of depression and alcohol dependence. *Soc Sci Med* 2004;58:565–75.
- 26 Ladin K, Daniels N, Kawachi I. Exploring the relationship between absolute and relative position and late-life depression: evidence from 10 European countries. *Gerontologist* 2010;50:48–59.
- 27 Muntaner C, Li Y, Xue X, et al. County level socioeconomic position, work organization and depression disorder: a repeated measures cross-classified multilevel analysis of low-income nursing home workers. *Health Place* 2006;12:688–700.
- 28 Kondo N, Sembajwe G, Kawachi I, et al. Income inequality, mortality, and self-rated health: meta-analysis of multilevel studies. *BMJ* 2009;339:b4471.
- 29 Subramanian SV, Kawachi I. Whose health is affected by income inequality? A multilevel interaction analysis of contemporaneous and lagged effects of state income inequality on individual self-rated health in the United States. *Health Place* 2006;12:141–56.
- 30 Chiavegatto Filho AD, Lebrao ML, Kawachi I. Income inequality and elderly self-rated health in Sao Paulo, Brazil. *Ann Epidemiol* 2012;22:863–7.
- 31 Kendler KS, Karkowski LM, Prescott CA. Causal relationship between stressful life events and the onset of major depression. *Am J Psychiatry* 1999;156:837–41.
- 32 Kendler KS, Karkowski LM, Prescott CA. Stressful life events and major depression: risk period, long-term contextual threat, and diagnostic specificity. *J Nerv Ment Dis* 1998;186:661–9.
- 33 Power RA, Lecky-Thompson L, Fisher HL, et al. The interaction between child maltreatment, adult stressful life events and the 5-HTTLPR in major depression. *J Psychiatr Res* 2013:1032–5.
- 34 Renzaho AM, Houng B, Oldroyd J, et al. Stressful life events and the onset of chronic diseases among Australian adults: findings from a longitudinal survey. *Eur J Public Health* 2013:1–6.
- 35 Barker ED, Copeland W, Maughan B, et al. Relative impact of maternal depression and associated risk factors on offspring psychopathology. *Br J Psychiatry* 2012;200:124–9.
- 36 Hirschfeld RM, Weissman MM. Risk factors for major depression and bipolar disorder. In: Davis KL, Charney D, Coyle JT, Nemeroff C. eds *Neuropsychopharmacology: the fifth generation of progress*. 5th edn. Philadelphia, Pennsylvania: Lippincott, Williams, & Wilkins; 2002:1017–25.
- 37 Grant BF, Dawson DA, Stinson FS, et al. The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug Alcohol Depend* 2004;74:223–34.
- 38 Grant BF, Goldstein RB, Chou SP, et al. Sociodemographic and psychopathologic predictors of first incidence of DSM-IV substance use, mood and anxiety disorders: results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Mol Psychiatry* 2009;14:1051–66.
- 39 Kennedy BP, Kawachi I, Prothrow-Stith D. Income distribution and mortality: cross sectional ecological study of the Robin Hood index in the United States. *BMJ* 1996;312:1004–7.
- 40 Grant BF, Dawson DA, Hasin DS. *The alcohol use disorder and associated disabilities interview schedule-DSM-IV version*. Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism; 2001.
- 41 Chen YY, Subramanian SV, Acevedo-Garcia D, et al. Women's status and depressive symptoms: a multilevel analysis. *Soc Sci Med* 2005;60:49–60.
- 42 Jun HJ, Subramanian SV, Gortmaker S, et al. A multilevel analysis of women's status and self-rated health in the United States. *J Am Med Womens Assoc* 2004;59:172–80.
- 43 Kawachi I, Kennedy BP, Gupta V, et al. Women's status and the health of women and men: a view from the States. *Soc Sci Med* 1999;48:21–32.
- 44 Koenen KC, Lincoln A, Appleton A. Women's status and child well-being: a state-level analysis. *Soc Sci Med* 2006;63:2999–3012.
- 45 McLaughlin KA, Xuan Z, Subramanian SV, et al. State-level women's status and psychiatric disorders among US women. *Soc Psychiatry Psychiatr Epidemiol* 2011;46:1161–71.
- 46 Wilkinson RG, Pickett KE. Income inequality and socioeconomic gradients in mortality. *Am J Public Health* 2008;98:699–704.
- 47 Adjaye-Gbewonyo K, Kawachi I. Use of the Yitzhaki index as a test of relative deprivation for health outcomes: a review of recent literature. *Soc Sci Med* 2012;75:129–37.
- 48 Kawachi I, Kennedy BP. *The health of nations: why is inequality harmful to your health*. New Press, 2003.
- 49 Shumaker SA, Hill DR. Gender differences in social support and physical health. *Health Psychol* 1991;10:102–11.
- 50 Wilson DK, Klierer W, Bayer L, et al. The influence of gender and emotional versus instrumental support on cardiovascular reactivity in African-American adolescents. *Ann Behav Med* 1999;21:235–43.
- 51 Carver CS, Scheier MF, Weintraub JK. Assessing coping strategies: a theoretically based approach. *J Pers Soc Psychol* 1989;56:267–83.

Copyright of Journal of Epidemiology & Community Health is the property of BMJ Publishing Group and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.