

Income inequality, trust and homicide in 33 countries

Frank J. Elgar¹, Nicole Aitken²

1 Department of Psychology, Carleton University, Ottawa, ON, Canada

2 Department of Psychology, University of Ottawa, Ottawa, ON, Canada

Correspondence: Frank J. Elgar, Department of Psychology, Carleton University, Ottawa, ON, Canada K1S 5B6, tel: +1 613 520 2600 ext: 1542, fax:+1 613 520 3667. e-mail: frank_elgar@carleton.ca

Received 4 January 2010, accepted 27 April 2010

Background: Theories of why income inequality correlates with violence suggest that inequality erodes social capital and trust, or inhibits investment into public services and infrastructure. Past research sensed the importance of these causal paths but few have examined them using tests of statistical mediation. **Methods:** We explored links between income inequality and rates of homicide in 33 countries and then tested whether this association is mediated by an indicator of social capital (interpersonal trust) or by public spending on health and education. Survey data on trust were collected from 48 641 adults and matched to country data on per capita income, income inequality, public expenditures on health and education and rate of homicides. **Results:** Between countries, income inequality correlated with trust ($r = -0.64$) and homicide ($r = 0.80$) but not with public expenditures. Trust also correlated with homicides ($r = -0.58$) and partly mediated the association between income inequality and homicide, whilst public expenditures did not. Multilevel analysis showed that income inequality related to less trust after differences in per capita income and sample characteristics were taken into account. **Conclusion:** Results were consistent with psychosocial explanations of links between income inequality and homicide; however, the causal relationship between inequality, trust and homicide remains unclear given the cross-sectional design of this study. Societies with large income differences and low levels of trust may lack the social capacity to create safe communities.

Keywords: income, violence, homicide, trust, income inequality, social capital

Background

Societies with smaller income differences between rich and poor tend to have better health and less violence.^{1,2} Research has found that homicides and assaults tend to be most common where income inequality is highest.^{3–7} In the U.S., for instance, income inequality accounts for about half the variance in state homicide rates.⁶ Kawachi *et al.* reported significant correlations between state-level income inequality and rates of homicide (0.74), assault (0.50), burglary (0.44) and robbery (0.36).⁸ Another U.S. study found that the correlation between state-level income inequality and violent crime involving firearms was 0.76.⁶ Wilson and Daly examined similar data in Chicago neighbourhoods and found a correlation of 0.75 between income inequality and homicide rates.⁹ Among Canadian provinces, this same correlation was 0.85.¹⁰ Meta-analytic reviews have concluded that income inequality is significantly associated with several forms of violence, including homicide, assault, rape and robbery.^{11,12} Most of this research has been carried out in the U.S.; however, international data show similar patterns.^{13–15} In a group of 21 rich countries, Pickett *et al.* reported a partial correlation of 0.71 between income inequality and homicides per capita (controlling for differences in per capita income).⁷ A study by the World Bank examined international trends in homicides and robberies between 1965 and 1995 and concluded that income inequality and crime rates were positively correlated after controlling for differences in per capita income and other social determinants.¹⁶

While there is compelling evidence of an association between income inequality and violence, the mechanisms that account for this association are less clear. Theoretical

discussions in this area have focused on two causal paths. One is the psychosocial impact of inequality, as evidenced by levels of trust, hostility and social capital,^{1,2} and the other is material investments by governments into public services and infrastructure.¹⁷

The psychosocial hypothesis focuses on social capital, which is defined as features of social networks and norms that facilitate coordination and cooperation for mutual benefit.¹⁸ One contextual indicator of social capital is the level of interpersonal trust in the society. The idea is that income inequality intensifies social hierarchies, which affects levels of social anxiety and class conflict and erodes social trust and cohesion.^{1,2,19} A rigid social hierarchy defined by wide income gaps is seen to contribute to a harsh, individualistic social environment that ineffectively suppresses violent behaviour. Support for this hypothesis comes from studies that showed that trust negatively correlates with income inequality and violence.^{6,19} Data from the World Values Survey showed that countries with high crime rates scored high on self-interested values (e.g. keeping money that you have found, lying in your own self-interest).²⁰ Kawachi *et al.* found that interpersonal trust across the 50 U.S. states was negatively correlated with rates of homicide (-0.80), rape (-0.43), assault (-0.65) and robbery (-0.58).⁸

The neomaterialist hypothesis posits that income inequality relates to political and economic policies that shape the quality of public services and infrastructure, thereby contributing to health and safety. The sobering implication of this hypothesis is that income disparities might inhibit social spending as the rich has less to gain by redistributing wealth for the common good (e.g. in the form of public health care or public schools).¹⁷ Kaplan and colleagues reported that U.S. states

with higher income inequality spent a smaller proportion of their budgets on education and had poorer educational outcomes.²¹ State expenditures on public health and education in the U.S. are negatively correlated with both income inequality and adult mortality.^{17,22,23} Whether international differences in public expenditures also account for the association between income inequality and violent crime has not yet been explored.

It is important to note that these psychosocial and neomaterial hypotheses are not mutually exclusive. U.S. states with low levels of trust are characterized by conservative values that support a minimal role for government in social life.² Pearce and Davey Smith proposed that social and economic policies affect social capital at the community level and its various health and social consequences.²⁴ Societies that are more equal and trusting might support more public spending on social services as compared to less equal, less trusting societies. In other words, both psychosocial and neomaterial paths might mediate the association between income inequality and violence.

To date, there has not been a direct comparison of psychosocial and neomaterial paths in explaining the links between income inequality and violence. Despite much debate about the mechanisms that might account for the social consequences of income inequality, few studies have actually tested mediated effects. Attempts to test mediation by social capital or social trust relied on comparing zero-order correlations between income inequality and violence to partial correlations that control for their associations with the mediating variable.^{6,8} This approach is prone to type-II error and yields less reliable results than regression-based analysis.^{25,26} Sometimes, small changes in a regression slope or correlation coefficient that occur when a third variable is controlled can easily cause the statistic to drop from significance ($P < 0.05$) to non-significance ($P > 0.05$) even when the third variable does not account for much shared variance. In the behavioural sciences, the recommended analysis of mediation involves a series of regression models, incorporates covariates (e.g. per capita income) and estimates differences between direct and indirect (mediated) effects.²⁷ Therefore, the aim of the present study was to (i) test the association between income inequality and homicide—an indicator of violent crime—and (ii) determine how much this association was explained by societal differences in trust and public expenditures on health and education.

Methods

Data sources

The 2006 International Social Survey Programme (ISSP; www.issp.org) surveyed 48 641 adults in 33 rich and middle-income countries: Australia, Canada, Chile, Croatia, Czech Republic, Denmark, Dominican Republic, Finland, France, Germany, Hungary, Ireland, Israel, Japan, South Korea, Latvia, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Russian Federation, Slovenia, South Africa, Spain, Sweden, Switzerland, Taiwan, United Kingdom, United States, Uruguay and Venezuela). The ISSP has no selection criteria *per se*; researchers from each country elected to participate in the network and agreed to a common protocol for sample selection, interview methods and survey measures. The number of respondents per country ranged from 910 (Canada) to 2939 (South Africa). The sample was 53.5% female and ranged in age from 15 to 98 ($M = 46.5$, $SD = 17.4$) years. Surveys were administered by mail or telephone and collected data on age, gender, education [six-point scale ranging from 0 (no formal education) to 5 (university degree completed)] and social status ['In our society today there are

groups which tend to be towards the top and groups which tend to be towards the bottom. Where would you put yourself on this scale?'] Responses ranged from 1 (lowest) to 10 (highest)]. Participants also indicated their level of agreement with two statements about trust, 'There are only a few people I can trust completely' and 'If you are not careful, other people will take advantage of you.' Responses ranged from 1 (strongly agree) to 5 (strongly disagree) and were averaged to create an index of trust. Sampling was stratified to best represent the adult population of each country. The total response rate in the 2006 ISSP survey was ~79%. Response rates within countries were unrelated to sample characteristics and trust.

The World Health Organisation Statistical Information System (www.who.int/whosis) provided data about these 33 countries on total government spending on health and education in 2006 [percent of gross domestic product (GDP)] and number of homicides per 100 000 population.²⁸ Health and education spending in terms of percentage of total GDP ranged from 3.7% (Dominican Republic) to 15.8% (Norway; $M = 10.4\%$, $SD = 3.1\%$). Homicides per 100 000 of population ranged from 0.5 (Japan) to 47.5 (South Africa; $M = 5.8$, $SD = 10.5$). A summary of country characteristics is shown in Supplementary table S1.

The World Bank World Development Indicators database provided data on per capita income and income inequality.²⁹ Individual income was estimated using gross national income per capita at 2007 purchasing parities in U.S. dollars. Income inequality was measured using the Gini index, which ranges from 0 (perfect equality where all persons have equal income) to 1 (perfect inequality where one person has all the income and the rest have none). The Gini index was calculated using 2006 data from nationally representative surveys, adjusted for household size and based on consumption rather than income wherever possible.²⁹ Per capita income ranged from \$3710 (Philippines) to \$53 650 (Norway; $M = \$26\,242$, $SD = \$12\,450$). The Gini index ranged from 0.247 (Denmark) to 0.578 (South Africa; $M = 0.36$, $SD = 0.09$).

Data analysis

ISSP sampling weights were applied to individual-level data and post-stratification weights based on country population were applied to country-level analyses to best represent the total population of 1.3 billion. Data on continuous variables were centred and scaled to a mean of 0 and an SD of 1 to avoid collinearity problems and facilitate comparisons of effects (regression slopes). Homicide rates were log transformed (base 10) given their skewed distribution and nonlinear association with income inequality [$R^2 = 0.40$ (linear), 0.67 (exponential)].

Because the potential for ecological fallacies has troubled previous studies on income inequality, a multilevel analysis of trust was carried out using MLwiN 2.18 (Centre for Multilevel Modelling, University of Bristol, UK). These analyses tested whether the country-level associations between income inequality and trust were attributable to ISSP sample characteristics. Previous research had found that trust tends to be higher in females than in males and among those who are older, more educated and have higher social status.³⁰ This analysis involved fitting a two-level linear regression model with variances specified at individual (*i*) and country (*j*) levels:

$$\begin{aligned} \text{Trust}_{ij} = & b_0_{ij} + b_1 \text{Gender}_{ij} + b_2 \text{Age}_{ij} + b_3 \text{Education}_{ij} \\ & + b_4 \text{SocialStatus}_{ij} + b_5 \text{PerCapitaIncome}_{ij} \\ & + b_6 \text{Income Inequality}_{j} \end{aligned}$$

Multilevel analysis is generally preferred when testing cross-level associations but it does not permit level-2 outcome variables (e.g. homicide rates) to be estimated by level-1 predictors (e.g. trust). Therefore, tests of mediation were based on associations at the country level. Individual-level data from the two survey items about trust were combined and then aggregated to country averages. This procedure determined that trust was lowest in the Dominican Republic ($M=1.6$) and highest in Denmark ($M=2.9$). Associations between country-level characteristics were carried out using PASW 18 (SPSS Inc., Chicago, IL, USA) and involved partial correlations between country characteristics that controlled for differences in per capita income. Mediation analysis involved three linear regression models that tested the four paths shown in figure 1.²⁷ The first model tested a direct, unmediated effect of income inequality on homicide (Path c). The second tested the effect of income inequality on both potential mediators (Path a). The third tested the effect of each potential mediator on homicide (Path b) and the effect of income inequality on homicide with the mediator controlled (Path c'). These models included per capita income as a covariate. The significance of mediation was calculated by dividing the mediated effect (ab) by its standard error resulting in a Z -score.²⁶

Results

Correlations between income inequality, trust, public expenditures and homicide are shown in table 1. Income inequality negatively correlated with trust ($r=-0.64$, $P<0.01$; Supplementary figure S1) and positively correlated with homicide ($r=0.80$, $P<0.01$; Supplementary figure S2) but

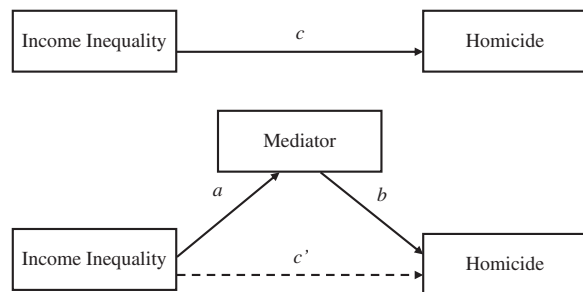


Figure 1 Illustration of a direct, unmediated path between income inequality and homicide (above) and an indirect, mediated path between income inequality and homicide (below)

did not correlate with public expenditures. Trust also negatively correlated with homicide ($r=-0.58$, $P<0.01$; Supplementary figure S3) but not with public expenditures.

A multilevel analysis verified that the association between country-level income inequality and individual-level trust was significant after sample characteristics were taken into account. Table 2 shows the results of this analysis. In a base model with no predictors (Model 1), the interclass coefficient of trust was 0.09, indicating large variation at the individual level. Model 2 results showed that trust related to older age, female gender, higher education and higher social status. With these individual differences and per capita income taken into account, income inequality was still significantly associated with less trust, $B=-0.12$, $P<0.01$ (Model 3).

Table 3 shows the results of the mediation analysis, using the mean level of trust in each country as a country-level variable. The association between income inequality and homicide (Path c) was statistically significant; each SD increase in income inequality corresponded to 0.82 SD increase in homicide. Associations between income inequality and trust, and between trust and homicide, were also significant. Each SD increase in income inequality corresponded to a 0.65 SD decrease in trust, and each SD increase in trust corresponded to a 0.58 SD decrease in homicide. Indicative of partial mediation, the relation between income inequality and homicide remained significant after differences in trust were accounted for (Path c'), but was weaker than when it was the lone predictor. The mediated relation was statistically significant, $B_{ab}=0.37$, $SE_{ab}=0.12$, $Z_{ab}=2.97$, $P<0.01$. In contrast, income inequality did not relate to public expenditures and public expenditures did not relate to homicide. Therefore, public expenditures were ruled out as a mediating variable. The variance inflation factors in these models were all below 5, indicating that multicollinearity did not bias the results.³¹

Table 1 Correlations between income inequality, trust, public expenditures and homicide ($N=33$)

Variable	1.	2.	3.	4.
1. Income inequality	–			
2. Trust	–0.64*	–		
3. Public expenditures	–0.17	0.06	–	
4. Homicides (\log_{10})	0.80*	–0.58*	–0.09	–

Adjusted for differences in per capita income.

* $P<0.01$.

Table 2 Results of multilevel linear regression of trust

Variable	Model 1		Model 2		Model 3	
	B	SE	B	SE	B	SE
Constant _{ij}	0.07*	0.06	0.01	0.06	0.00	0.06
Sample characteristics ($N=48\,641$)						
Age _{ij}			0.07*	0.02	0.07*	0.02
Gender (female) _{ij}			0.06*	0.02	0.06*	0.02
Education _{ij}			0.11*	0.03	0.11*	0.03
Social status _{ij}			0.06*	0.02	0.06*	0.06
Country characteristics ($N=33$)						
Per capita income _j					0.08*	0.07
Income inequality _j					–0.12*	0.05
Level 1 variance	0.96	0.27	0.94	0.26	0.94	0.26
Level 2 variance	0.1	0.02	0.08	0.02	0.05	0.01
Interclass correlation		0.09		0.08		0.05
–2 Log likelihood		174 463.20		173 568.20		173 551.40

* $P<0.01$.

Table 3 Mediation analysis of income inequality and homicide

Path	Mediating variable: Trust				Mediating variable: Public expenditures			
	B	SE	t	VIF	B	SE	t	VIF
c	0.82	0.11	7.34*	1.14	0.82	0.11	7.34*	1.14
a	-0.65	0.14	-4.52*	1.14	-0.09	0.10	-0.09	1.14
b	-0.58	0.15	-3.86*	1.10	-0.18	-0.35	-0.51	3.99
c'	0.75	-0.15	5.13*	1.92	0.83	0.12	7.20*	1.17
Z _{ab}	2.97*				0.45			

Paths correspond to those shown in figure 1.

All models were adjusted for differences in per capita income. VIF, variance inflation factor.

* $P < 0.01$.

Incidentally, different results were found using partial correlations to test for mediation. The correlation shown in table 3 between income inequality and homicide, $r = 0.80$, changed insignificantly to $r = 0.69$ after controlling for differences in trust, $Z = 0.98$, $P = 0.16$, and was relatively unchanged ($r = 0.79$) after controlling for differences in public expenditures, $Z = 0.11$, $P = 0.46$. Partial correlations would have shown evidence of mediation by neither trust nor public expenditures.

Discussion

Previous research into the association between income inequality and violence has focused on the reliability of their association across populations and forms of crime. This research lacks an exploration of mediating mechanisms. This study examined income inequality and homicide rates in 33 countries and the mediation of their association by interpersonal trust and public expenditures on health and education. Links between inequality, trust and homicide were strongly significant and regression-based analyses showed evidence of partially mediated relation between inequality and homicide through trust. No such associations were found involving public expenditures.

The study contributes three findings to the literature. First, a strong association was found between income inequality and international differences in homicide rates in a group of high- and middle-income countries. Income inequality accounted for nearly two-thirds of the variance ($R^2 = 0.64$) in homicide after per capita income differences were taken into account. Finland, Denmark, Norway, Japan and Sweden had relatively low inequality and homicide and high levels of trust (Supplementary figures S1–S3). Japan is unique among these countries in that it has relatively small income differences before taxes and it spends less on public health and education (9.9% of GDP) than Scandinavian countries (12.2–15.8% of GDP; table S2). This result is consistent with previous studies that found that income inequality is a social determinant of violence.^{6,10,11,16} The association does not appear to be specific to homicide or even to adult populations. Similar links with income inequality have been found in prison populations,^{2,32} assault and robbery in adults^{6,8} and school bullying in school-aged adolescents.³³ Around the world, it is unequal distributions of wealth, not the level of wealth *per se*, that identifies the most dangerous places to live.

Second, ecological and multilevel analyses of the data showed that income inequality negatively correlated with interpersonal trust.³⁰ Wide class differences and rigid social hierarchies might increase the 'social distance' between individuals, thereby reducing the levels of social cohesion and social capital.² Coincidentally, trends of increasing income

inequality that occurred over the past few decades coincided with declining levels of trust. Since the 1960s, and especially during the Regan/Thatcher era of the 1980s, income inequality rose sharply in the U.S. and Britain, while trust and other indicators of social capital have declined.^{18,19,34}

Third, the association between income inequality and homicide was partially mediated by trust and not by public expenditures. This result is consistent with the psychosocial hypothesis that income inequality relates to violent crime partly through its corrosive influence on social capital. Others suggested that that income inequality contributes to many of the precursors to violence (e.g. disrespect, shame, bullying, hostility and retaliation).^{2,8,35} Trust might not be the most evident signature of equal societies, nor the most powerful social determinant of homicide, but it does appear to carry an association from inequality to homicide. Societies with large income differences and low levels of trust may lack the social capacity to inhibit violence and create safe communities. Of course, we cannot discount the neomaterial hypothesis given that our data were limited to health and education spending and did not reflect investments into policing and crime prevention. It could also be that differences in public expenditures share weaker associations with homicide than with all-cause mortality.²²

Strengths of the study include a diverse sample of high- and middle-income countries from around the world. Studying income inequality between countries rather than within countries reinforces the notion that inequality relates to homicide independently of its local context. Indeed, the large differences in homicide rates between countries with low inequality (e.g. Japan and Denmark) and countries with high inequality (e.g. South Africa and Dominican Republic) are difficult to attribute to geographic proximity or to cultural, political or historical similarities. Future research on the contributions of income inequality to ill-health and violence should examine both developed and developing nations with appropriate statistical controls to account for differences in wealth. Another strength of the study was a multilevel analysis of trust, which helped to eliminate the possibility of 'ecological fallacies' or false inferences about group differences based on aggregated data. Income inequality related to trust after individual and country characteristics were taken into account.

The limitations of the study should also be noted. First, our focus on trust and homicide excluded other dimensions of social capital and forms of criminal activity. Other indicators of social capital (e.g. group affiliations and norms of reciprocity) and subjective accounts of crime and violence might have led to stronger conclusions regarding the psychosocial correlates of income inequality. Second, specification of a neomaterial pathway from inequality to homicide in terms of public health and education expenditures excluded public and private services that might relate to homicide (e.g. police and correctional services). Third, we were unable to control for international differences in the availability of firearms and other weapons as was done in the study by Kennedy *et al.*⁶ Fourth, the cross-sectional design precluded any conclusions about causal effects and antecedent-consequence conditions. We acknowledge the possibility of mutual influences on income inequality and violent crime where, for instance, homicides might negatively affect levels of trust in communities and contribute to individualistic values, reduction in social spending and community segregation.³⁶ Time trend analysis of income inequality and homicide would better reveal the nature of their association.

It is also worth considering whether the strength and direction of associations between income inequality, trust, public expenditures and homicide are consistent at different

levels of data aggregation.³⁷ Homicide or income inequality could have segregating effects on communities and simultaneously relate to high in-group trust and low out-group trust. In addition, public expenditures could be more important across contextual units with some degree of political autonomy (e.g. states, counties or municipalities). Such regional data were unavailable from the ISSP, WHOSIS and World Bank; however, testing such associations within a multilevel framework might help identify complex cross-level interactions.

In 1979, criminologist John Braithwaite wrote that overall levels of crime do not change significantly through anti-poverty programmes but that 'gross economic measures to reduce the gap between the poor and the rest of the population would reduce crime' (p. 231).³⁸ Hillyard and Tombs,³⁹ Wilkinson and Pickett² and others have since argued that focusing solely on individual acts of violence and individual risk factors distracts attention from the role of the state in tackling the problem of income inequality. Indeed, if 64% of the variance in homicide rates is attributed to income inequality, then crime reduction policies that ignore income inequality relinquish much of their potential impact on reducing homicide. As Reiman noted in the now classic text, 'The rich get richer and the poor get prison,' significant and lasting reductions in homicide can best be achieved by strategies that take the wider socioeconomic context fully into account.⁴⁰ Otherwise, Braithwaite's grim conclusion warns of us of a more violent future.

Supplementary data

Supplementary data are available at *EURPUB* online.

Acknowledgements

The authors thank Richard Wilkinson and Kate Pickett for their comments on earlier drafts of this article.

Funding

Canadian Institutes of Health Research and Social Sciences and Humanities Research Council (to F.J.E.).

Conflicts of interest: None declared.

Key points

- Income inequality is a social determinant of ill-health and violence.
- Explanations of why income inequality relates to violence focus either on the psychosocial environment or on spending on public services and infrastructure.
- In a group of 33 countries, income inequality accounted for 64% of the variance in homicide rates.
- Interpersonal trust partially accounted for the association between income inequality and homicide. Public expenditures on health and education did not relate to homicide.

References

- Marmot M, Friel S, Bell R, et al. *Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health*. Geneva: World Health Organization, 2008.
- Wilkinson RG, Pickett KE. *The spirit level: why more equal societies almost always do better*. London: Penguin, 2009.
- Braun D. Negative consequences to the rise of income inequality. *Res Pol Soc* 1995;5:3–31.
- Butchart A, Engström K. Sex- and age- specific relations between economic development, economic inequality and homicide rates in people aged 0–24 years: a cross-sectional analysis. *Bull World Health Organ* 2002;80:797–805.
- Choe J. Income inequality and crime in the United States. *Econ Lett* 2008;101:31–3.
- Kennedy BP, Kawachi I, Prothrow-Stith D, et al. Social capital, income inequality, and firearm violent crime. *Soc Sci Med* 1998;47:7–17.
- Pickett KE, Mookherjee J, Wilkinson RG. Adolescent birth rates, total homicides, and income inequality in rich countries. *Am J Public Health* 2005;95:1181–3.
- Kawachi I, Kennedy BP, Wilkinson RG. Crime: social disorganization and relative deprivation. *Soc Sci Med* 1999;48:719–31.
- Wilson M, Daly M. Life expectancy, economic inequality, homicide, and reproductive timing in Chicago neighbourhoods. *BMJ* 1997;314:1271–4.
- Daly M, Wilson M, Vasdev S. Income inequality and homicide rates in Canada and the United States. *Can J Criminol* 2001;43:219–36.
- Hsieh C-C, Pugh MD. Poverty, income inequality, and violent crime: a meta-analysis of recent aggregate data studies. *Crim Justice Rev* 1993;18:182–202.
- Wilkinson RG, Pickett KE. Income inequality and population health: a review and explanation of the evidence. *Soc Sci Med* 2006;62:1768–84.
- Krahn H, Hartnagel TF, Gartrell JW. Income inequality and homicide rates: cross-national data and criminological theories. *Criminology* 1986;24:269–95.
- Pickett KE, Wilkinson RG. Child wellbeing and income inequality in rich societies: ecological cross sectional study. *BMJ* 2007;335:1080.
- Szwarcwald CL, Bastos FI, Viacava F, de Andrade CL. Income inequality and homicide rates in Rio de Janeiro, Brazil. *Am J Public Health* 1999;89:845–50.
- Fajnzylber P, Lederman D, Loayza N. Inequality and violent crime. *J Law Econ* 2002;45:1–40.
- Lynch J, Smith GD, Hillemeier M, et al. Income inequality, the psychosocial environment, and health: comparisons of wealthy nations. *Lancet* 2001;358:194–200.
- Putnam RD. *Bowling alone: collapse and revival of American community*. New York: Simon and Schuster, 2000.
- Uslaner EM. *The moral foundations of trust*. Cambridge: Cambridge University Press, 2002.
- Halpern D. Moral values, social trust and inequality. *Br J Criminol* 2001;41:236–51.
- Kaplan GA, Pamuk ER, Lynch JW, et al. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *BMJ* 1996;312:999–1003.
- Dunn JR, Burgess B, Ross NA. Income distribution, public services expenditures, and all cause mortality in US States. *J Epidemiol Community Health* 2005;59:768–74.
- Ronzio CR, Pamuk E, Squires GD. The politics of preventable deaths: local spending, income inequality, and premature mortality in US cities. *J Epidemiol Community Health* 2004;58:175–9.
- Pearce N, Davey Smith G. Is social capital the key to inequalities in health? *Am J Public Health* 2003;93:122–9.
- Gelfand LA, Mensinger JL, Tenhave T. Mediation analysis: a retrospective snapshot of practice and more recent directions. *J Gen Psychol* 2009;136:153–76.
- MacKinnon DP, Lockwood CM, Hoffman JM, et al. A comparison of methods to test mediation and other intervening variable effects. *Psychol Methods* 2002;7:83–104.
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol* 1986;51:1173–82.
- Jagger C, Cox B, Le Roy S, EHEMU. *Health expectancy calculation by the Sullivan method*, Third Edition. EHEMU Technical Report, 2006.
- World Bank. *World development indicators (WDI)*. Washington, DC: World Bank, 2006.

- 30 Uslaner EM. *The moral foundations of trust*. Cambridge: Cambridge University Press, 2002.
- 31 Miles J, Shelvin M. *Applying regression and correlation*. Sage: London, 2003.
- 32 Dorling D. The politics and economics of murder. *Environ Plan A*, 2008;40:255–7.
- 33 Elgar FJ, Craig W, Boyce W, et al. Income inequality and school bullying: multilevel study of adolescents in 37 countries. *J Adolesc Health* 2009;45:351–9.
- 34 Brehm J, Rahn W. Individual-level evidence for the causes and consequences of social capital. *Am J Pol Sci* 1997;41:999–1024.
- 35 Shaw C, McKay H. *Juvenile delinquency and urban areas*. Chicago: University of Chicago Press, 1942.
- 36 Halpern D. Moral values, social trust and inequality. *Br J Criminol* 2001;41:236–51.
- 37 Fritzell J. Commentary: on form, comparability, and levels in the income and health relationship. *Int J Epidemiol* 2005;34:293–4.
- 38 Braithwaite J. *Inequality, crime and public policy*. London: Routledge.
- 39 Hillyard P, Tombs S. Beyond criminology?. In: Hillyard P, Pantazis C, Tombs S, Gordon Dd, editors. *Beyond criminology? Taking harm seriously*. London: Pluto Press, 2004, 10–29.
- 40 Reiman J. *The rich get richer and the poor get prison: ideology, class and criminal justice*, 5th edn. Boston: Allyn and Bacon, 1998.