# Income inequality and homicide rates in Canada and the United States[1]

**Martin Daly**
and
**Margo Wilson**
*Department of Psychology*
*McMaster University*
*Hamilton, Ontario*
and
**Shawn Vasdev**
*Department of Psychology*
*State University of New York*
*Stony Brook, USA*

*Certaines recherches, démontrant que les inégalités des revenus (établis au moyen de l'indice Gini) prédisent (Ils sont peut-être même déterminants) les taux d'homicides au niveau national ainsi qu'aux niveaux des états et des villes, demeurent peu concluantes parce qu'il existe une relation négative entre les inégalités économiques et le revenu moyen. Dans ce texte, les auteurs font état de comparaisons entre les provinces canadiennes pour tester le Gini et le revenu moyen. Ils ont trouvé un rapport positif entre l'indice Gini et le taux d'homicides. Les changements temporels dans l'indice Gini prédisent aussi les changements dans le temps des taux d'homicides au niveau des provinces. Quand les provinces canadiennes et les états américains sont combinés, les inégalités des revenus au niveau local tendent à expliquer les taux d'homicides nationaux si différents de ces deux pays.*

*Previous research showing that income inequality (assessed by the Gini index) is a predictor, and hence a possible determinant, of homicide rates, whether at the cross-national, state, or city level, has been inconclusive because of a negative relationship between economic inequity and average income. Comparison across the Canadian provinces provides a test case in which average income and the Gini are, instead, positively correlated, and we find that the positive relationship between the Gini and the homicide rate is undiminished. Temporal change in the Gini is also shown to be a significant predictor of temporal change in provincial homicide rates. When Canadian provinces and U.S. states are considered*

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*together, local levels of income inequality appear to be sufficient to account for the two countries' radically different national homicide rates.*

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## Introduction

Several theoretical approaches in the social and biological sciences suggest that inequitable access to goods provokes antisocial behaviour and violence (Braithwaite 1979; Maynard Smith 1982; Runciman 1966; Wilkinson 1996; Wilkinson, Kawachi and Kennedy 1998; Wilson and Daly 1985). Homicide rates are highly variable between times and places (Archer and Gartner 1984), and Daly and Wilson (1988; 1997) have argued that much of this variability reflects the variable severity of interpersonal competition for limited material and social resources. Not only do many homicides occur in contexts, such as robbery and sexual rivalry, that are clearly competitive, but even those that have been called "expressive" rather than "instrumental" occur primarily in the shadow of status competition (Wilson and Daly 1985). Moreover, it is these competitive killings, especially those in which victim and killer are unrelated men, whose rates vary most widely and hence contribute the most to variation in homicide rates between places and over time (Daly and Wilson 1988). When rewards are inequitably distributed and those at the bottom of the resource distribution feel they have little to lose by engaging in reckless or dangerous behaviour, escalated tactics of social competition, including violent tactics, become attractive. When the perquisites of competitive success are smaller, and even those at the bottom have something to lose, such tactics lose their appeal.

One might therefore expect that income inequality will account for a significant fraction of the variability in homicide rates, and indeed it does. Cross-national analyses have consistently pointed to the Gini index of income inequality (Sen 1973), which equals 0.0 when all units (e.g., households or individuals) have identical incomes and approaches 1.0 when all income accrues to the single wealthiest unit, as a strong predictor of homicide rates. In fact, Gini (usually computed at the household level) consistently outperforms almost all other predictors, including various presumed indices of the average level of material welfare, suggesting that it is relative rather than

absolute deprivation that has the greater effect on local levels of violent competition.

Krohn (1976), for example, found the Gini index to be the best predictor of national homicide rates (r = .60) among several economic and social indices; the unemployment rate predicted homicide significantly less well (r = .23), and controlling for both unemployment and energy consumption per capita (an indicator of overall economic development) did not reduce the Gini-homicide correlation. Messner (1982) identified the rate of population growth and the Gini index as significant predictors of national homicide rates, while such candidate predictors as gross domestic product (GDP) per capita, percent urban dwellers, and school participation had no discernible effects. Krahn, Hartnagel, and Gartrell (1986) used data from more (and more diverse) countries than prior studies and from several years, and found that Gini, population growth, GDP per capita, and the percent of 15-19 year-olds in school were the best predictors of homicide rates; ethnic diversity, divorce rate, young adults as percent of population, defense expenditures, percent urban, and percent literate were weaker predictors that were significant in some analyses. Gartner (1990), however, found the divorce rate to be the single best predictor in 18 developed nations, with Gini second best, and additional lesser impacts of welfare spending, ethnic heterogeneity, female workers per household, battle deaths, and use of the death penalty. Interaction effects have also been noted: Krahn *et al.* (1986) suggest that income inequality has a stronger effect on homicide rates in more democratic societies, while Avison and Loring (1986) found its impact to be greater where ethnic diversity is greater. Only Gartner's (1990) study distinguished among components of the overall homicide rate, and she found that Gini predicts the rates at which adults, but not children, are killed, and is a stronger predictor of men's than of women's rates of homicide victimization. In general, the results of these cross-national studies are highly compatible with the proposition that homicide rates "assay" the local intensity of competitive conflict, especially among men.

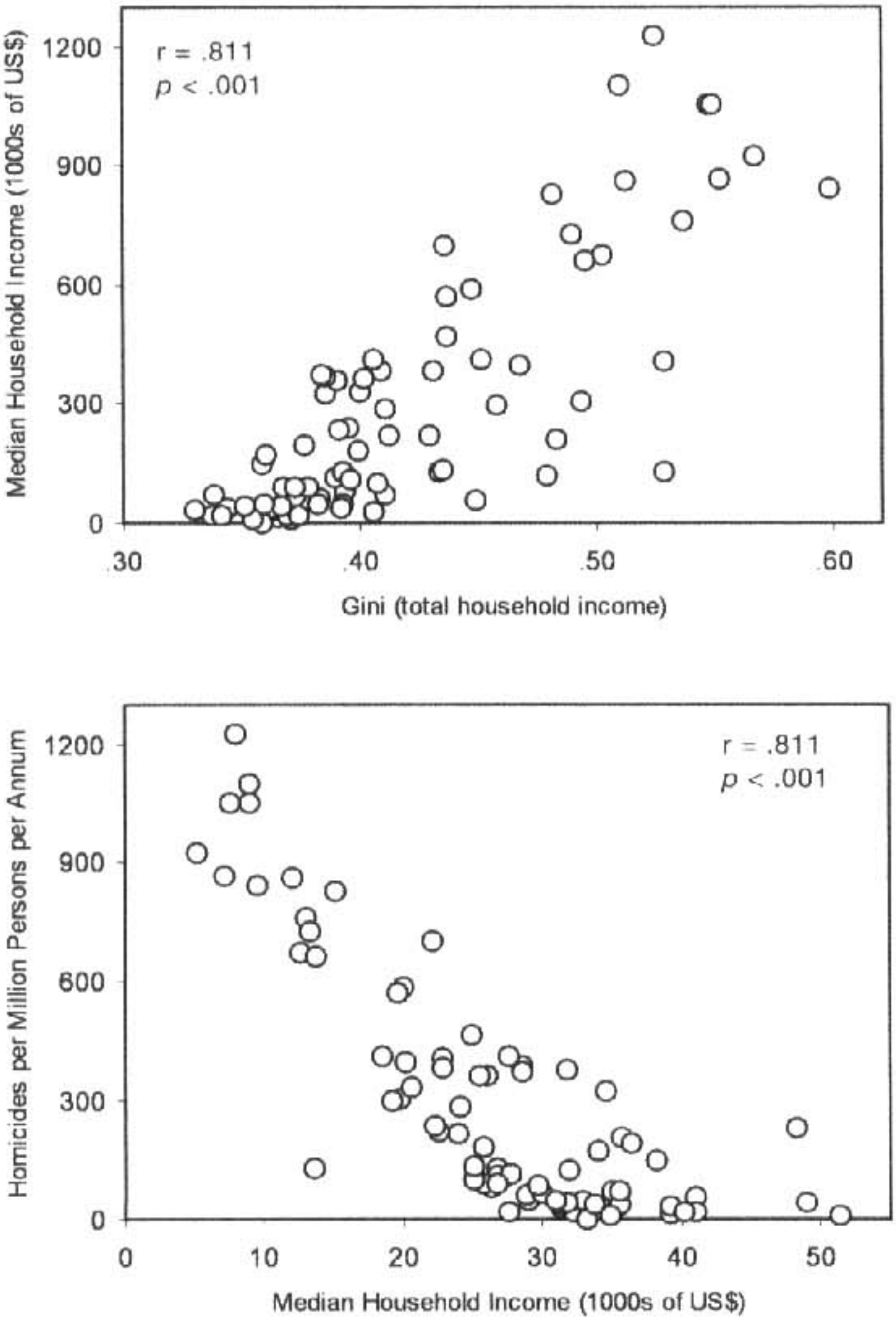
If inequity and the perception thereof indeed provoke escalated social competition and hence homicide, one might also predict more local effects. Research on income inequality and

homicide rates within, rather than between, nations is relatively scarce, but the results have been striking. Kennedy, Kawachi, and Prothrow-Stith (1996) found that the Gini index was significantly correlated with many components of mortality across the 50 United States in 1990, but with none more highly than homicide. Blau and Blau (1982) found that income inequality accounted for more of the variance in homicide rates among 125 U.S. cities than other measures including percent below the poverty line. Wilson and Daly (1997) analyzed data at an even finer scale, across Chicago neighbourhoods, and reported a bivariate correlation of r = .75 between income inequality and the homicide rate.

Despite this abundant evidence, the proposition that income inequality has a relevance distinct from that of absolute levels of material welfare remains controversial, largely because of the collinearity (that is, the statistical nonindependence and predictive redundancy) of the different predictor variables. In an early study of income inequality's effects on property crime, Jacobs (1981:14) asserted that, regardless of whether one is analyzing across nations, states, or cities, the correlation between measures of inequality and measures of average prosperity is "always negative, which implies that the poorer the area, the more one can expect unequal income distributions". In the state-level U.S. data set analyzed by Kennedy *et al.* (1996), for example, the correlation between Gini and median household income was r = - .57 ($p < .001$), and Nielsen and Alderson (1997) report a similarly robust association between these variables across U.S. counties. Wilson and Daly (1997) used a different income inequality measure (the Robin Hood Index) in their Chicago neighbourhood analyses, but when we compute the Gini coefficient for each neighbourhood from their data, we find its correlation with median household income to be - .82 ($p < .001$). It is therefore unsurprising that both economic measures exhibit strong relationships, opposite in sign, to the homicide rate (Figure 1).

This tendency for low average income and high income inequality to go hand in hand challenges the conclusion that inequity *per se* is critical, but the literature provides several partial answers to this challenge. As noted above, cross-national analyses regularly indicate that income inequality is a *better*

**Figure 1**
Homicide rates in 77 Chicago neighbourhoods as a function of the Gini coefficient of income inequality (upper panel) and of median household income (lower panel).




Income data (which represent pre-tax, post-transfer gross household income) and neighbourhood populations were obtained from the 1990 U.S. census. The numbers of homicides are averages for the 5-year period (1988-1992) centered on the census year, according to Vital Statistics obtained from the Illinois Department of Public Health.

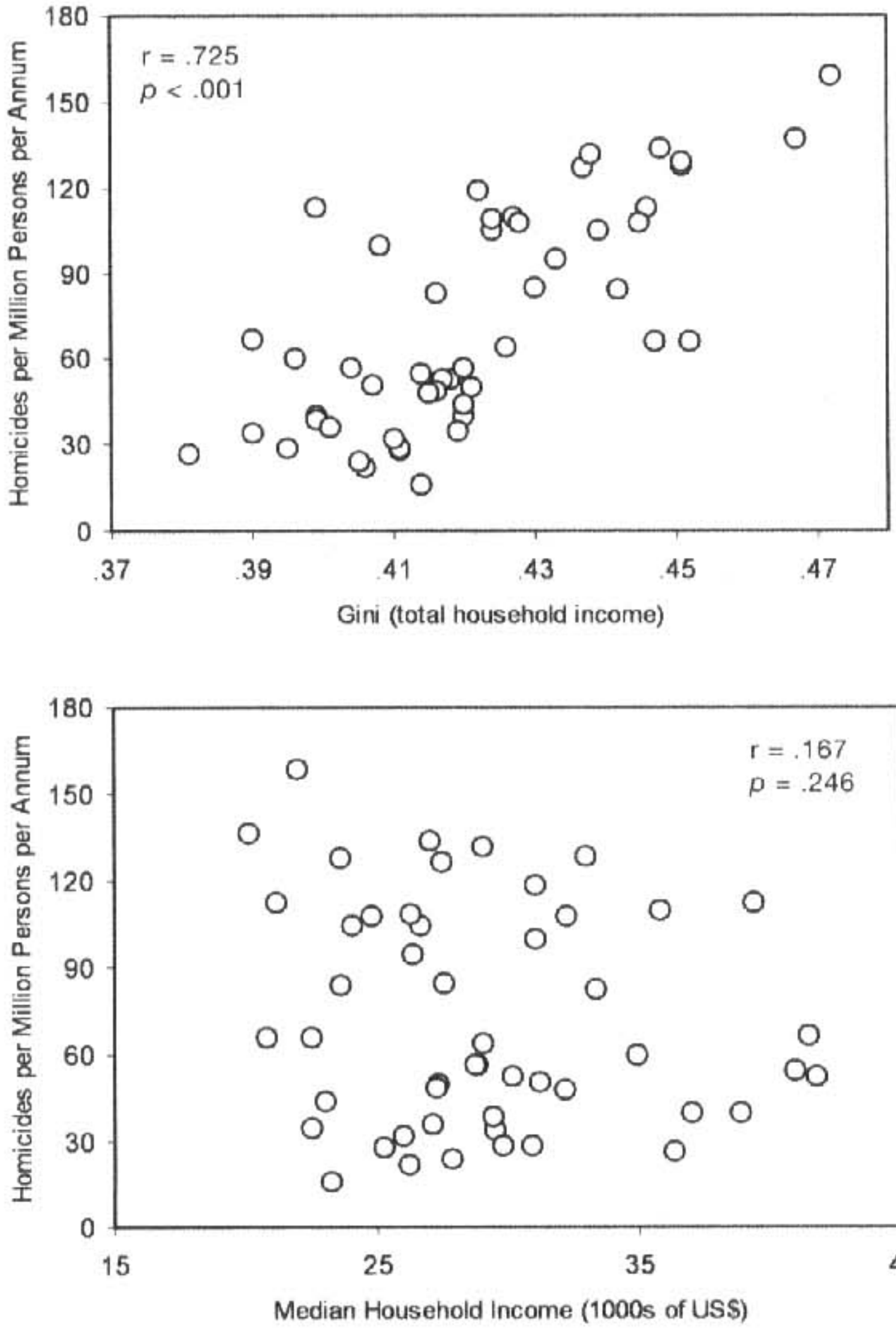
predictor of homicide than measures of average welfare or economic development, and the more local studies support the same conclusion. In Kennedy *et al.*'s U.S. data set for 1990, Gini is a strong predictor of state homicide rates whereas median household income is not, despite the two economic measures' substantial negative correlation (r = -.57) with one another (Figure 2). In Chicago, Wilson and Daly (1997) reported that income inequality provided significant additional prediction of neighbourhood homicide rates beyond that afforded by the *best* predictor, namely the neighbourhood-specific male life expectancy (computed with effects of homicide removed), whereas median household income did not. Nevertheless, the substantial collinearity among economic measures continues to bedevil interpretation of such data, and it should therefore be enlightening to locate and study a case in which Jacobs's generalization is contravened by a strong positive association between average income and income inequality. The Canadian provinces provide such a case.

## Income inequality and provincial homicide rates

Beginning with data for 1981, and with the omission of 1983, Statistics Canada (1982-1997) has annually computed and published province-level Gini indices, based on various family, household, and individual units, and on income before government transfer payments, after transfers but before taxes, and after both. For all these measures, correlations between income inequality and average income levels (published in the same tables) have been consistently positive, contravening Jacobs's (1981) generalization, with the Atlantic provinces generally at the low end on measures of both median income and income inequality, while British Columbia and Alberta are near the top.

Statistics Canada also maintains a case-by-case archive, the "Homicide Survey," containing information on all homicides known to Canadian police forces since 1974, from which we obtained annual totals for each province from 1981 through 1996. We then used these totals and census-based estimates of the population of each province in each year, as reported by Statistics Canada (1998), to compute homicide rates.

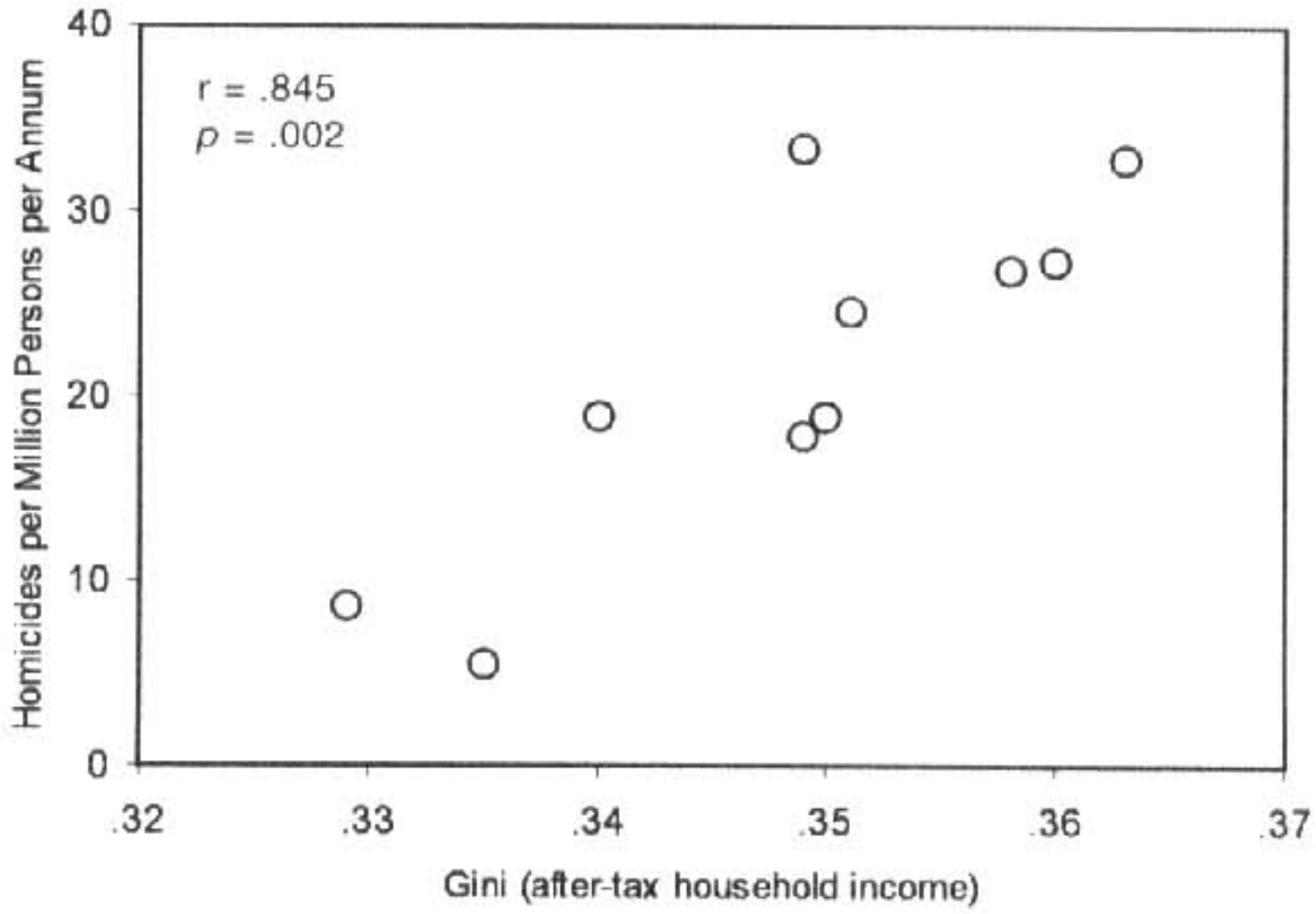
**Figure 2**
Homicide rates in the 50 United States in 1990 as a function of the Gini coefficient of income inequality (upper panel) and of median household income (lower panel).

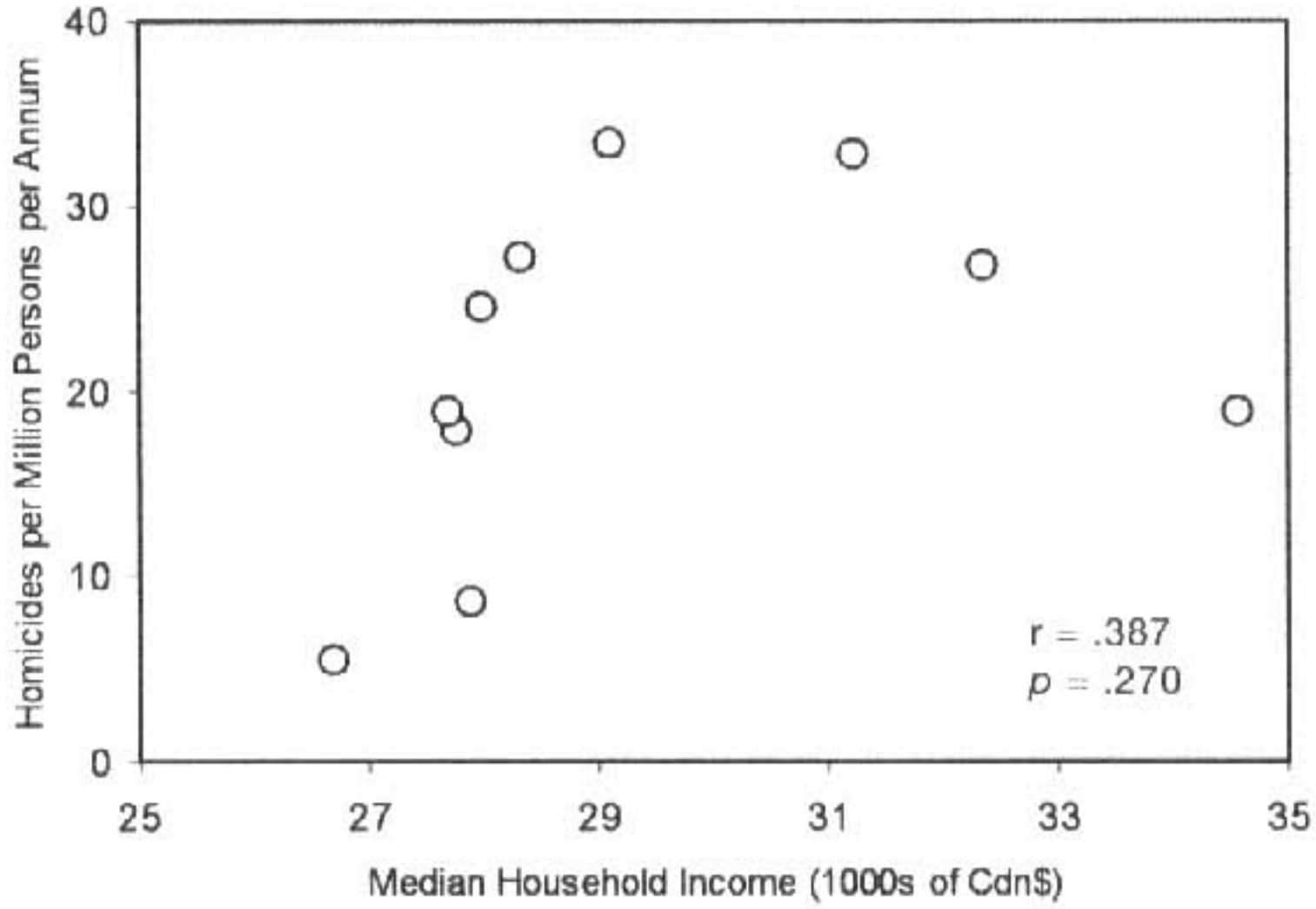



Income and Gini measures are based on pre-tax, post-transfer gross household incomes. Data courtesy of Bruce Kennedy, Harvard School of Public Health; see Kennedy *et al.* (1996) for further analysis of these and related data.

Figure 3 portrays these provincial homicide rates in relation to the Gini coefficient and median household income, with all measures averaged across the 15-year data set. Both economic measures are based on household income after taxes and transfers, for although prior cross-national and U.S. research on inequity and homicide has generally relied on pre-tax, post-transfer gross household income instead, after-tax income should be a better indicator of a household's available means. Income inequality is a strong and significant predictor of provincial homicide rates (r = .845, $p < .01$), and remains so when the impact of median household income is statistically removed (partial r = .816, $p < .01$). Median household income is positively related to the homicide rate (r = .387), but not significantly so ($p = .27$), and the association is negligible when the impact of Gini is statistically controlled (partial r = -.092, $p = .81$).

**Figure 3**
Homicide rates in 10 Canadian provinces as a function of the Gini coefficient of income inequality (upper panel) and of median household income (lower panel).






Homicide rates are averages of annual rates, computed on the basis of the numbers of victims according to Statistics Canada's Homicide Survey and provincial populations according to Statistics Canada (1998). Income and Gini measures are based on post-tax household incomes (Statistics Canada 1982-1997). All data are averages for the years 1981-1996, exclusive of 1983.

Table 1 portrays the associations among provincial homicide rates, Gini coefficients, and median household income, averaged over years, for four successive 4-year blocks. Income inequality has remained a strong and significant predictor of provincial homicide rates, accounting for more than half of the total variance therein, throughout the 16-year period under consideration. The tendency for average income to be positively associated with inequity has apparently increased over this time. Nevertheless, in each 4-year block, Gini is a significant predictor of homicide rates when median household income is statistically controlled, whereas the partial correlation between homicide rate and median household income with Gini statistically controlled never approaches statistical significance. In sum, these data provide further support for the proposition that income inequality is a better predictor of the homicide rate than median income, extending the generality of that proposition to a comparison in which median income and inequality are positively rather than negatively related.

**Table 1**
Interrelationships among the average annual values of the homicide rate, the Gini index of income inequality (computed on the basis of after-tax household incomes), and median household income, correlated across Canada's 10 provinces, for each of four successive 4-year blocks. (The first block is based on data for 1981, 1982 and 1984 only.

| | 1981-1984 | 1985-1988 | 1989-1992 | 1993-1996 |
|---|---|---|---|---|
| Bivariate correlations | | | | |
| Homicide-Gini | .833 ** | .757 * | .774 ** | .732 * |
| Homicide-Income | .470 | .404 | .374 | .342 |
| Gini-Income | .279 | .467 | .481 | .607 |
| Partial correlations | | | | |
| Homicide-Gini with Income controlled | .828 ** | .702 * | .731 * | .703 * |
| Homicide-Income with Gini controlled | .447 | .087 | .003 | -.190 |

* indicates 2-tailed $p < .05$, and ** 2-tailed $p < .01$.)

## Temporal trends in income inequality and homicide in Canada

If inequity affects homicide rates, income inequality might be expected to account for variability between times as well as between places. We therefore investigated whether the Gini coefficient can predict variations in Canadian homicide between years.

Results at the national level are unimpressive. The correlation between the national after-tax household Gini and the national homicide rate across the 16 years is positive, but small and far from statistical significance ($r = .201$, $p = .46$). This is unsurprising when one notes that, whereas the Canadian homicide rate fell over the 16-year period under consideration (from 26.3 homicides per million persons per annum in 1981-1984 to 20.8 in 1993-1996), the national after-tax Gini exhibited no conspicuous trend: the range of annual estimates is .351 to .363, and average annual values over four successive 4-year blocks are .357, .357, .356 and .356.

At the provincial level, signs that homicide may respond to changes in inequity are stronger. Correlations between a province's annual homicide rates and Gini coefficients across 15 years (Gini estimates for 1983 were lacking) were positive in 9 of 10 provinces and averaged .265. The null hypothesis that these 10 correlation coefficients were drawn from a distribution with mean of zero can be rejected ($t_{9df} = 4.34$, $p = .002$). The average correlation across the 15 years between any particular province's homicide rate and any *other* province's Gini coefficient was .089, and a given province's annual homicide rates were significantly more highly correlated with contemporaneous Gini coefficients for that same province than with the average contemporaneous Gini coefficient for the rest of the country ($t_{9df} = 2.27$, $p < .05$).

An alternative analytic approach is to remove the "fixed effects" of any stable regional differences and of any nation-wide temporal variation, by treating each province and each year as a dummy (0-1) predictor. For this analysis, we treated data for 10 provinces times 15 years as 150 cases, with homicide rate as the dependent variable and Gini, median household income, and the dummy variables as predictors, in various regression models. In general, regardless of which predictors were included and their order of entry, Gini and province dummies were significant predictors of these year-and-province-specific homicide rates, while median household income and year dummies were not. Table 2 presents results from regression models with and without the dummies. The following additional points are noteworthy: (1) the Gini coefficient is the single best predictor when entered alone, whereas median household income is not a significant predictor when entered alone; and (2) even if all other predictors are entered before the Gini coefficient, its addition to the equation yields a significant ($p < .001$) increase in $R^2$.

## Combined results for Canada and the United States

The U.S. data in Figure 2 and the Canadian data in Figure 3 are not directly comparable, because the former were computed on the basis of pre-tax income and the latter on the basis of after-tax income. The use of after-tax income in the Canadian

**Table 2**
Results of regressions predicting 150 province-and-year-specific homicide rates (the 10 Canadian provinces in 1981-1996, exclusive of 1983), on the basis of the Gini coefficient of after-tax household income inequality, median after-tax household income, and 25 dummy (0-1) variables representing the 10 provinces and 15 years.

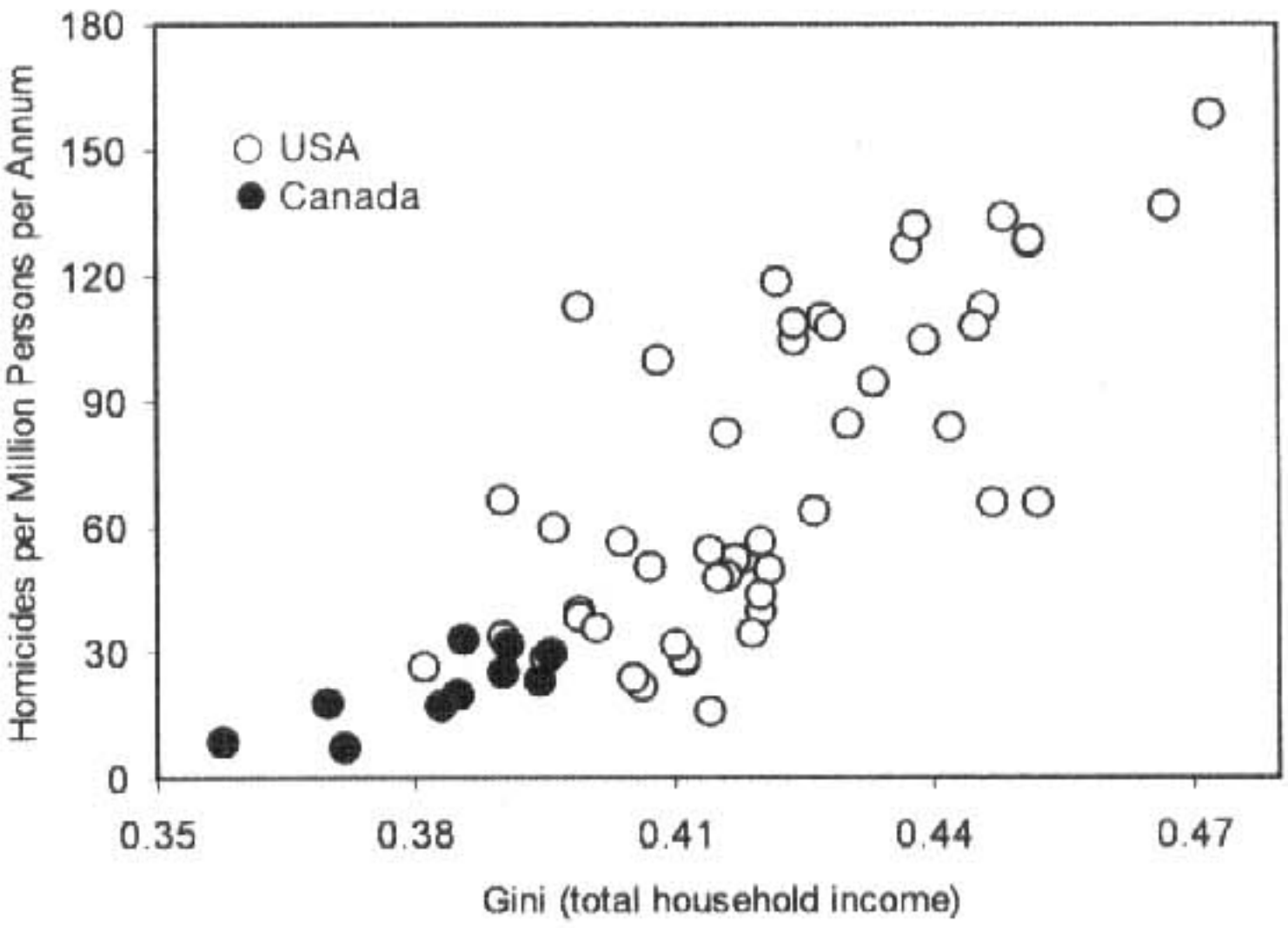
| | without dummies | | | with full set of year and province dummies | | |
|---|---|---|---|---|---|---|
| | ß | t | p | ß | t | p |
| Gini | .662 | 10.74 | .000 | .165 | 2.45 | .016 |
| Mdn income | .049 | .80 | .426 | .215 | .91 | .365 |
| Total model $R^2$ | | .443 | | | .833 | |

analyses both reduces the Gini index itself and reduces cross-province variability in both average income and Gini, relative to what the results would have been on a pre-tax income basis (see Tables in Statistics Canada, 1982-1997). On the one hand, this reduced variability might be expected to dampen associations between these economic variables and other phenomena such as homicide rates; on the other hand, if it is true that after-tax income is a better index of a household's means, then one might expect stronger associations insofar as the theoretical arguments linking violence to inequity are correct. In any event, the fact of the matter is that correlations between provincial homicide rates and the economic measures are scarcely affected by the choice of pre-tax or after-tax income. For example, the correlation of .845 between the average provincial homicide rate and the Gini based on after-tax income (Figure 3) actually increases to .868 if we compute the Gini on the basis of income after transfers but before taxes instead.

In order to make the Canadian data more comparable to the 1990 U.S. data in Figure 2, we computed provincial homicide rates for a 5-year period centered on 1990, and computed Gini coefficients on the same pre-tax household basis as was used in the U.S. data-base. Figure 4 presents a single combined distribution, for the 10 Canadian provinces and the 50 U.S. states, of homicide rates in relation to income inequality. The results suggest that local (state- and province-level) income inequality may explain a substantial proportion of the large and

much-discussed difference between these neighbours' national homicide rates.

**Figure 4**
Homicide rates in the 50 United States (1990) and the 10 Canadian provinces (average for 1988-1992), as a function of the Gini coefficient of income inequality computed on the basis of pre-tax gross household incomes.




U.S. data as in Figure 2; Canadian data derived from the same sources as those in Figure 3.

## Concluding remarks

The results of these analyses support the proposition that the degree to which resources are unequally distributed is a stronger determinant of levels of lethal violence in modern nation states than is the average level of material welfare. Previous studies have compared cases in which high income inequality and low average income go hand in hand, and although such studies have repeatedly found that income inequality is the better predictor of homicide rates, its greater causal impact is easily called into question by suggesting that both economic indices are imperfect proxies for a common overall welfare construct. The present analyses of Canadian data indicate that, where

income inequality and average income are instead positively correlated, the apparent impact of inequality on homicide rates is undiminished, while average income is apparently irrelevant.

Why are income inequality and median household income positively related across Canada provinces, when the correlation across U.S. states is strongly negative? The answer appears to reside in the effects of Canadian social programs in relatively poor regions. Countryman (1999), for example, has shown that unemployment insurance substantially reduces the family income Gini coefficient in the maritime provinces, has a smaller effect in Quebec, and has scarcely any effect in Ontario and the west; an especially striking result was that whereas Newfoundland had the lowest Gini of all ten provinces, it would have had the highest if unemployment benefits were nonexistent.

We referred to "modern nation states" at the outset of these concluding remarks because there are reasons to doubt that inequality and violence will be similarly associated in every sort of society. Inequitable access to material resources was apparently slight in at least some traditional non-state societies, especially those of foragers ("hunter-gatherers"), and yet homicide rates still dwarfed those of modern nation states (Daly and Wilson 1988). One reason for high homicide rates in these relatively egalitarian societies was the absence of modern medicine, which made a broader range of wounds life-threatening, but a possibly more important reason was the absence of police power and an effective system of disinterested third-party justice. In the absence of effective police and judiciary, a credible threat of personal or kin violence is a crucial social asset regardless of one's wealth or status, and the familiar tendency for violence to be primarily a recourse of the disadvantaged disappears (Chagnon 1988). It may also be the case that inequity in these non-state societies was actually higher in salient non-monetary currencies, namely marital and reproductive opportunity, than is the case in modern nation states where even high-ranking men are limited to one wife.

It must be conceded that the predictive power of the Gini index in Figures 1 to 4 may still reflect something other than an effect of income *distribution*. In two provinces with identical median incomes but different Gini coefficients, there are likely

to be more individuals below any given low-income threshold (and more above any given high-income threshold) in the province with the higher Gini, so if an individual's likelihood of committing a homicide were purely a (nonlinear) function of his personal income, differential homicide rates could follow as a result of different proportions living in poverty. Our analyses cannot address this issue, but previous research suggests that the apparent effects of income inequality are unlikely to be entirely due to "absolute" (as opposed to "relative") deprivation. Gartner (1990) used welfare spending as an indicator of absolute deprivation in cross-national analyses, and found that relative deprivation (indexed by Gini) was still a much stronger predictor of adult homicide victimization (although not of killings of children); a problem, of course, is that differential levels of welfare spending may reflect differential need or differential adequacy of response to need or both, making this an ambiguous index of absolute deprivation. Blau and Blau (1982) used percent below the poverty line as their indicator of absolute deprivation in analyses of homicide rates in 125 U.S. metropolitan areas; this measure and relative deprivation, assayed by the Gini index, were highly correlated (r = .70), but when both were entered as predictors of homicide rates in regressions, effects of the percent living in poverty vanished while those of the Gini remained strong. In this case, a potential problem is that the "poverty line" is a political artifact that may or may not be a good indicator of absolute deprivation. An alternative approach is that of Waldmann (1992), who found in cross-national analyses that the proportion of GDP taken by the richest 5% of the populace remains a significant predictor of infant mortality rates even when the real income of the poorest 20% is statistically controlled. Such an approach has apparently not been taken with homicide, but it might be worthwhile. It is not inconceivable that violent escalation of social competition at the bottom of the social hierarchy is indirectly exacerbated by an awareness of extreme wealth at the top that contributes to a pervasive cultural perception and acceptance that one is living in what Frank and Cook (1995) have called a "winner-take-all society".

Finally, if the effects of income inequality on homicide are indeed mediated by effects on male-male competition, we might predict that such inequity will be especially relevant to the incidence of homicides in which victim and killer are unrelated

male rivals (Gartner 1990), and that inequity's impact will interact with such demographic factors as age structure and sex ratios (Krahn *et al.* 1986, Courtwright 1996). These, too, are issues for further research.

## Note

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