JUSTICE QUARTERLY
https://doi.org/10.1080/07418825.2020.1729392

Perceived Inequality and Cross-National Homicide Rates

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ABSTRACT

Economic inequality is a persistent structural covariate of cross-national homicide rates. The most common criminological explanation is that perceived inequality creates frustration among individuals at the lower end of the income distribution, this frustration generates latent anger, and this anger occasionally results in violence. There are reasons to question the validity of this explanation. First, the theoretical reasoning of this population-level phenomenon is reductionist, relying on individual-level explanation. Second, perceived inequality is poorly operationalized by its most common measure, the Gini index, meaning this hypothesis is never actually directly tested. Third, the Gini index is strongly correlated with inequality's main competing economic explanation, poverty. To address these limitations we used the World Values Survey and the International Social Survey Programme to obtain national-level measures of perceived inequality that are much more consistent with the proposed theoretical construct and weakly correlated with poverty. Controlling for a range of structural covariates we found no consistent evidence of an association between population-level perceived inequality and homicide rates.

ARTICLE HISTORY
Received 17 April 2019
Accepted 5 February 2020

KEYWORDS
Cross-national homicide; income inequality; perceived income inequality

National homicide rates vary substantially. This variation appears to be caused in part by structural and cultural characteristics like the economy (Messner & Rosenfeld, 1997), criminal justice policy (Paré, 2014), modernization (Pinker, 2011), and governments' ability to provide social protection to citizens (Rogers & Pridemore, 2013). One of the most commonly tested structural covariates of cross-national homicide rates is economic inequality (LaFree, 1999; Trent & Pridemore, 2011). The favored hypothesis is that perceived inequality leads to frustration among individuals at the lower end of the wealth or income distribution, this frustration leads to anger, and latent anger occasionally erupts into expressive violence (Blau & Blau, 1982; Messner, 1982). Thus, nations with higher levels of perceived inequality are expected to have higher homicide rates.

Although the inequality-homicide thesis has been tested many times cross-nationally and is among the most consistent findings in the literature, there are limitations

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to the validity of this relationship and its explanation. First, research shows that when poverty is controlled the inequality-homicide association often disappears or becomes unstable (Paré & Felson, 2014; Pridemore, 2008, 2011). Second, the prevailing criminological explanation is reductionist, relying on individual-level social psychology to explain a population-level phenomenon. Third, the theoretical construct of perceived inequality is poorly operationalized by its common measure, the Gini index, so any statistical association cannot be considered evidence for the frustration-aggression hypothesis. Fourth, the Gini index is strongly correlated with measures of the main competing economic explanation, poverty, and this multicollinearity makes it difficult to isolate the unique effects of each (Land, McCall, & Cohen, 1990). We employed measures of perceived inequality to address these limitations, providing the first cross-national test of the perceived inequality thesis using a population-level theoretical construct and an appropriate measure of it.

Literature review

The theoretical limitation: an individual explanation of a national phenomenon

Why might a nation's level of economic inequality be related to its homicide rate? There are two main explanations, one preferred by economists and one by criminologists. Our focus is on the latter, but we begin by briefly introducing the former.

Competition for scarce resources among young men

A main hypothesis utilized by economists rarely appears in criminological studies of inequality and homicide: Competition for scarce resources, felt most acutely by young men. According to Becker (1968), crime rates are due in part to differences between potential gains from crime and associated opportunity costs. Over the years this formulation increasingly focused on differences between nations' rich and poor (Fajnzylber, Lederman, & Loayza, 2002; Kelly, 2000 Kelly & Evans, 2017). Generally describing this association, Daly (2016, 1) stated "A local homicide rate is a manifestation of the local level of competition for scarce resources, and economic inequality is a major determinant of the severity of that competition." Based on the belief homicide offending and victimization rates are highest among young men, over time inequality explanations progressively converged on the effects on young men of tight labor markets and competition for resources. In his argument for this account, Muggah (2015) stated "[t]hose either perpetrating or suffering from homicide are typically young people who are out of work, out of school and out of options."

For this explanation to be true, young men must have the highest homicide rates and there must be an association between the proportion of young people in a population and its homicide rate. Despite popular belief, neither is true cross-nationally. Literature reviews found no consistent positive effect on homicide rates of the proportion of the population that was young (Nivette, 2011; Trent & Pridemore, 2011). One review showed 87% of models tested in 32 published studies found no such association (Rogers & Pridemore, 2017). A recent study found 15–24 year-old age-specific homicide rates are not consistently the highest between nations or within nations over time (Rogers, 2014) and found no impact of percent young on total or sex-

specific cross-national homicide rates (Rogers & Pridemore, 2016, 2017; see also Baumer & Wolff, 2014). These findings cast doubt on competition for scarce resources among young men as an explanation for a cross-national association between inequality and homicide rates.[1]

Perceived inequality, unfairness, and frustration: a reductionist explanation

The most common account among sociologically oriented criminologists of why inequality and violence rates should covary across geographic units is that individuals at the bottom end of the income or wealth distribution experience resentment when they perceive unfair inequality. The resentment creates frustration, and individuals with greater levels of latent frustration are more likely to manifest anger in various ways, including violence. Thus, areas with higher levels of economic inequality should have higher homicide rates.

Today's reliance on the frustration-aggression explanation derives from scholarship in the 1970s and 1980s. For example, McDonald (1976) described feelings of injustice stemming from economic inequality (see also Krahn, Hartnagel, & Gartrell, 1986), and Hansmann and Quigley (1982) discussed the frustration resulting from it. Messner (1980, 1982) and Blau and Blau (1982) were the genesis of modern criminological research on economic inequality and homicide. Messner (1982) drew on Mertonian anomie theory to argue individuals economically deprived relative to others experience strain and thus abandon societal values for crime. Blau and Blau (1982, 119) held that individuals perceiving their economic position as unequal experienced "resentment, frustration, hopelessness, and alienation," and stated "[h]igh rates of criminal violence are apparently the price of racial and economic inequalities" (Blau & Blau, 1982, 126). The frustration-aggression explanation is intuitively appealing and continues to hold sway today both in empirical research and theorizing. For example, it is Roberts and Willits' (2015) main reasoning in their study of inequality and homicide in the United States that operationalized the former with multiple measures. It is also a central element of recent theorizing (Agnew & Messner, 2015) describing the social psychological process of how individuals perceive an unfair environment, judge when success is beyond reach, experience strain as a result, and respond with offending.

A key limitation with this popular explanation in the context of social structure and violence is that it attempts to explain the population-level phenomenon of national homicide rates via individual-level characteristics like frustration or resentment. Still, the cross-national empirical association is persistent, the potential effect of perceived economic inequality is compelling given evidence of inequality's effect on population health (Wilkinson & Pickett, 2006), and as we will see below the perceived inequality thesis has yet to be truly tested because of invalid measures.[2] Thus, this explanation demands further consideration and a suitable test.

[1]Another key limitation is that studies testing this hypothesis do not measure age-specific economic inequality or age-specific homicide rates in nations but instead measure total inequality and the overall homicide rate.

[2]While there is additional research focusing on the effect of economic variables on homicide at the national level (Rosenfeld, 2014), these studies are outside of the focus of our analysis. The dominant theoretical argument within the literature accounting for why inequality should be associated with homicide victimization is frustration-aggression.

What is to be done?: Reconceptualizing perceived inequality as a national characteristic

If we are truly interested in country-level structural effects then we must reconceptualize perceived inequality as a characteristic of nations. This would allow a more direct test of the hypothesis that nations with higher population-level perceived inequality are nations with higher homicide rates.

This is reconceptualization is similar to other population-level concepts—like polity, religiosity, education, and family strength—in the social structure and violence literature. One can think of the level of perceived inequality among residents in an area just as one can think of the level of social disorganization among area residents. Scholars in other fields have conceived of and measured perceived inequality as a population characteristic on which countries vary and examined its effects on national outcomes like happiness, distributive justice, and well-being (Ball & Chernova, 2008; Macunovich, 2011; Schneider & Valet, 2017). Esping-Anderson and Nedoluzhko (2017) and Nielsen (2017) pointed to the importance of national expectations about income inequality and how they are reflected in citizens' perception of a fair society. These societal-level attitudes and values are meaningful markers of perceived inequality (Kelly & Evans, 2017).

This is a separate theoretical concept from the *objective* amount of economic inequality in a nation (which might be estimated with the Gini coefficient) but represents instead the level of economic inequality *perceived* by the population. Formal measures of inequality differ from perceived inequality across nations, and the amount of this difference varies by nation type (Bublitz, 2016). Figure 1 provides a graphical representation of the perceived income inequality measures found within other literatures compared to the Gini Coefficient (Asthana, Gibson, Moon, Bringham, & Dicker, 2004; Bhuiyan & Szulga, 2017; Hadler, 2005; Kenworth & McCall, 2008; Kerr, 2014; Lübker, 2004, 2007; Macunovhic 2002, 2011; Medgyesi, 2013; Murthi & Tiongson, 2009; Nieuhaus, 2014; Schneider & Valet, 2017; Smyth & Qian, 2008).[3] The graphs shows that more often than not, the perceived measure of income inequality is not similar to the objective measure of income inequality (the Gini Coefficient). Based on the theorizing discussed earlier, we should expect a positive association at the national-level between perceived inequality and homicide rates.

The methodological limitation: an invalid measure

The Gini coefficient does not measure perceived inequality

Although the Gini coefficient has been used almost exclusively to measure inequality in cross-national homicide studies there are key reasons to believe it is not a valid measure of the theoretical construct of perceived inequality.[4] The Gini coefficient does not meet construct validity, which assesses how well a real world operationalization matches a theoretical concept.

[3]The Alphabetical Country Code is available at https://unstats.un.org/unsd/tradekb/knowledgebase/country-code.

[4]The 20–20 ratio—which measures the amount of income received by the top 20% of the population relative to the amount received by the bottom 20% of the population—is occasionally used, but it is almost always extremely highly correlated with the Gini coefficient.

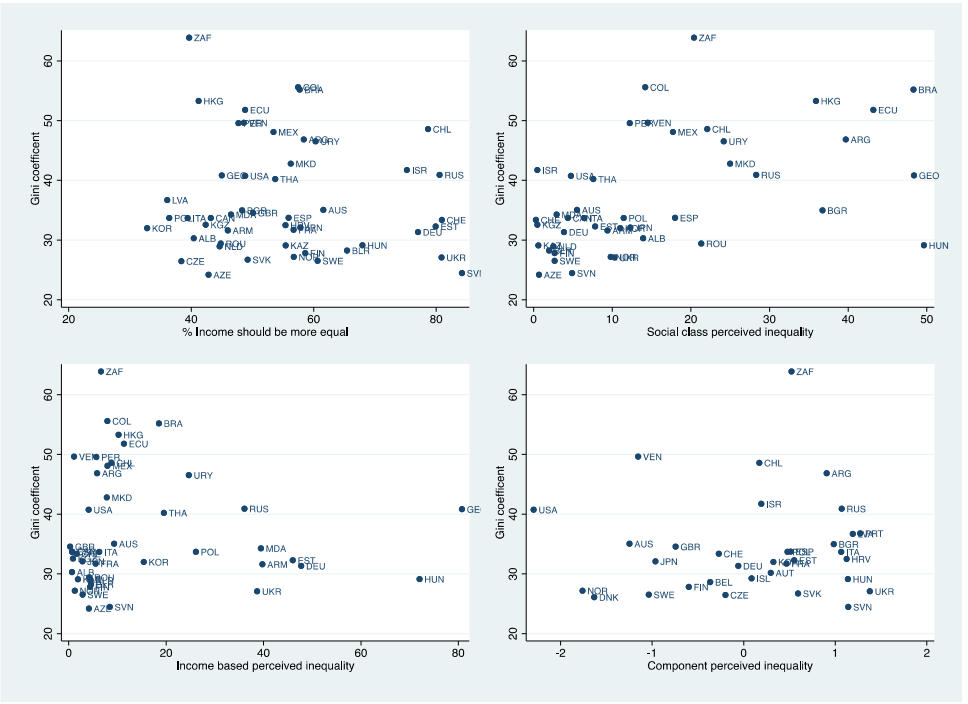

Figure 1. Perceived income inequality and Gini coefficient scatter plots.
Note: Nation names are United Nations 3-letter alphabetic country code.

First, the Gini coefficient provides a summary statistic of the income or wealth distribution. The theoretical concept of interest is perceived unfair inequality. On its face, the measure does not match the concept. If the Gini coefficient were correlated with other measures of perceived inequality this would provide convergent validity. As we show below, however, it is only very weakly correlated with the survey-based measures of perceived inequality used in other fields to explore the effects of perceived inequality on various outcomes (Bublitz, 2016; Clark & D'Ambrosio, 2015; Esping-Anderson & Nedoluzhko, 2017; Kelly & Evans, 2017).

Second, the theoretical explanation for the association between perceived inequality and homicide is at the individual level, but the Gini coefficient is measured at the national level. The proposition is that individuals experience income or wealth inequality, perceive this inequality to be unfair, and the unfairness creates pent up anger that can result in outbursts of interpersonal violence. The scholars interested in inequality's influence on homicide, however, situate their studies in the literature on the macro-level structural covariates of violence and test the association with units like cities, states, and nations. Construct validity is suspect when operationalizing an individual-level concept with a national-level measure, and inferring individual-level behavior from national-level tests is questionable.[5]

[5]Compositional effects could be operating, of course, but this is not the explanation provided by scholars testing this hypothesis, who situate their findings in the literature on the structural (i.e., macro-level) covariates of homicide rates.

Third, the Gini coefficient measures neither citizens' perceived inequality nor frustration due to it. The Gini coefficient describes the income or wealth distribution in a population. This does not measure if individuals actually perceive inequality, nor does it measure if any inequality is perceived to be unfair. In the classic study on inequality and violence largely responsible for subsequent research on the topic, Blau and Blau (1982) clearly distinguished between types of inequality and implications for perceptions of unfairness. The authors stated "inequalities in rewards for differences in skills tend to be viewed as justifiable" (p. 118). Other literatures also address this. For example, Norton and Ariely (2011) found US respondents prefer an income distribution similar to Sweden's, which has less inequality. In their sample of German workers, Schneider and Valet (2017) also observed a desire for distributive justice, or legitimate inequality. On the other hand, illegitimate inequality, which Blau and Blau (1982) described as based on ascribed status like ethnicity (but that can also be based on other unfair forms of opportunity and resource distribution) is a source of frustration and aggression according to the authors. As a statistical description of dispersion, the Gini coefficient does not measure the extent to which inequality is perceived or tolerated.

Nations with similar Gini coefficients can look very different socially and economically. This is meaningful for how residents perceive inequality and its unfairness, and thus meaningful for explanations of homicide rates based on perceived inequality. Two nations may have the same level of income inequality and thus the same Gini coefficient, but the government of one may provide substantial social protection and thus its citizens may not perceive as much inequality or not perceive it as unfair because they are supported by unemployment and retirement benefits, welfare payments, and subsidies for housing, education, and healthcare. Citizens of nations with a large proportion of the population retired or young but in college, both of which influence a measure of income inequality like the Gini coefficient, may not perceive inequality or not gauge it as unfair. Alternatively, populations in nations at different levels of development or with different types of political economic regimes have different expectations about income distribution and thus vary in their perceptions of and attitudes toward inequity (Bublitz, 2016; Clark & D'Ambrosio, 2015; Esping-Anderson & Nedoluzhko, 2017; Kelly & Evans, 2017). These situations are common and they have a direct impact on the frustration-aggression explanation of perceived inequality's effect on national homicide rates, but they are not accounted for by the Gini coefficient.

Statistical correlation between the Gini coefficient and poverty

Another major limitation of the Gini coefficient as a measure of perceived inequality is that it is often highly correlated with measures of or proxies for poverty, which is a main confounder and competing economic explanation of area homicide rates. In the initial cross-national homicide studies that included both poverty and the Gini coefficient, the correlation was $\geq$.68 (Paré & Felson, 2014; Pridemore, 2008; Rogers & Pridemore, 2013). When a proxy for poverty was added to prior cross-national studies of inequality and homicide that did not initially include one (Fajnzylber et al., 2002; Savolainen, 2000), the correlation between the two was $>$.70 (Pridemore, 2011).

A high correlation between two independent variables may lead to estimates of effects on a dependent variable that are not unique because they share substantial information (Gordon, 1968; Land et al., 1990). This multicollinearity can have an important impact on the substantive meaning of coefficients due to partialing since the effect of one may be assigned to the other. This makes it difficult to estimate discrete effects, which is especially problematic here because while measures of inequality and poverty are highly correlated statistically the theoretical explanations for why each influences homicide rates are very different.

Therefore, it is difficult to determine if the Gini Coefficient becoming non-significant in prior studies (Pridemore, 2008, 2011) is the result of omitted variable bias or multicollinearity. If omitted variable bias, this would indicate the inequality-homicide association is spurious due to the omission of poverty. Non-spuriousness is a necessary condition of a causal statement. If omitted variable bias is at fault then one could make the case that inequality may not be a necessary control variable in a statistical model that includes poverty. However, if the loss of significance is due to multicollinearity then inequality might remain a necessary variable and researchers must employ various methods to address the nuisance of multicollinearity in models that include both poverty and inequality.

What is to be done?: Measure perceived inequality at the national level

To test the perceived inequality-homicide thesis cross-nationally requires a societal-level measure of perceived inequality. In the absence of direct measures of societal perceived inequality the use of the Gini coefficient as a proxy in prior research is understandable. Over the years, however, the Gini coefficient has become equated with the perceived inequality theoretical construct. This reification led many of us to use it out of habit and to fail to seek out truer measures as data availability and quality expanded globally. Substantially better measures of the theoretical construct of the amount of unfair economic inequality in a nation as perceived by residents now exist and are commonly used in other disciplines.[6]

A measure of perceived inequality should maximize the extent to which it captures perceived unfair inequality and minimize the extent to which it captures legitimate inequality or distributive justice. Further, the measure should not only capture the theoretical concept, but as a form of discriminant validity should be weakly correlated with a measure of its main competing economic explanation, poverty. Multiple instruments survey respondents across nations and thus allow us to aggregate individual perceptions about perceived inequality into national-level averages the same way one would get a score on area characteristics like fear of crime or collective efficacy. We used the *World Values Survey* and the *International Social Survey Programme* to create several measures of national-level perceived inequality. While this approach has its own limitations, it is much less problematic than the limitations of the Gini coefficient. Further, unlike prior studies using the Gini coefficient that found it to be highly

[6]Perceived inequality is measured differently across multiple studies, but nearly all studies employee some survey-based measure from either the WVS (Bhuiyan and Szulga 2017; Bjørnskov, Dreher, and Fischer 2007; Frey and Stutzer 2000; Inglehart 1990; Inglehart, Foa, Peterson, and Welzel 2008; Kerr 2014; Macunovich 2011; Murthi and Tiongson 2009; Sen 1980; Verme 2009) or the ISSP (Guillaud 2013; Kerr 2014; Lübker 2004, 2007; Medgyesi 2013; Nieuhaus 2014; Osberg and Smeeding 2006; Suhrcke 2011).

Table 1. Sample of nations by measures of perceived income inequality.

Income should be more equal (WVS) (n = 52)		Perceived income 1 & 2 WVS (n = 46)		ISSP measure (n = 35)	
Albania	Kyrgyzstan	Albania	Macedonia	Argentina	South Korea
Argentina	Latvia	Argentina	Mexico	Australia	Latvia
Armenia	Macedonia	Armenia	Moldova	Austria	New Zealand
Australia	Mexico	Australia	Netherlands	Belgium	Norway
Azerbaijan	Moldova	Azerbaijan	New Zealand	Bulgaria	Poland
Belarus	Netherlands	Belarus	Norway	Chile	Portugal
Brazil	New Zealand	Brazil	Poland	Croatia	Russian Federation
Bulgaria	Norway	Canada	Romania	Czech Republic	Slovakia
Canada	Poland	Chile	Russian Federation	Denmark	Slovenia
Chile	Romania	Colombia	Singapore	Estonia	South Africa
Colombia	Russian Federation	Ecuador	Slovenia	Finland	Spain
Croatia	Singapore	Estonia	South Africa	France	Sweden
Czech Republic	Slovakia	Finland	South Korea	Germany	Switzerland
Ecuador	Slovenia	France	Spain	Hungary	Ukraine
Estonia	South Africa	Georgia	Sweden	Iceland	United Kingdom
Finland	South Korea	Germany	Switzerland	Israel	United States
France	Spain	Hong Kong SAR	Thailand	Italy	Venezuela
Georgia	Sweden	Hungary	Ukraine	Japan	
Germany	Switzerland	Italy	United Kingdom		
Hong Kong SAR	Thailand	Japan	United States		
Hungary	Ukraine	Kazakhstan	Uruguay		
Israel	United Kingdom	Kuwait	Venezuela		
Italy	United States	Kyrgyzstan			
Japan	Uruguay				
Kazakhstan	Venezuela				
Kuwait					

correlated with measures of poverty, as we show below our measures of perceived inequality were weakly correlated with poverty.

Data and method

Sample

Our unit of analysis was the nation. Sample size ranged from 35 to 52. Table 1 lists nations by availability for each measure of perceived inequality. The sample included all nations with data for homicide victimization and relevant waves of the *World Values Survey* (WVS) and *International Social Survey Programme* (ISSP). We excluded Trinidad and Tobago because it was an outlier on multiple influence diagnostics. The small sample represents a limitation but is common to cross-national research, especially studies of inequality and homicide, due to missing data (Messner & Rosenfeld, 1997; Pridemore, 2008; Savolainen, 2000).

Data

Dependent variable

The Appendix lists all variables, definitions, and data sources. The outcome variable was homicide victimizations per 100,000 residents. We obtained homicide and

population counts from the World Health Organization (2015). We defined homicide using the International Classification of Diseases 10th revision, categories X85-Y09: "homicides and injury purposely inflicted by another person." We averaged homicide rates between 2004 and 2010 to smooth data and reduce influence of extreme values in a single year. We chose 2004–2010 based on data availability from the WVS and ISSP, which we used to measure perceived inequality.

While other data sources provide more information on homicide across nations they contain serious limitations regarding how homicide victimization is measured. Kanis, Messner, Eisner, and Heitmeyer (2017) address in depth the reasons why sources outside of the WHO mortality data are seriously flawed to the point that the organizations responsible for the data do not recommend utilizing them for national comparisons. An additional problem is that some WHO estimates of homicide victimization utilize structural covariates, including a measure of inequality like the Gini coefficient, to help generate the homicide estimates (World Health Organization, 2015, 66). This means the same or very similar measures of inequality are present on both sides of the statistical equation when testing the association between inequality and homicide rates.

Perceived inequality

Our main independent variable was population level perceived inequality, which we measured using the *World Values Survey (*2014) and *International Social Survey Programme (*2012). Our interest is perceived inequality as a national-level characteristic and thus we aggregated individual responses by measuring the percent of respondents who affirmatively answered the relevant questions. To do this we borrowed from well-established bodies of literature to create four measures of perceived inequality.

The WVS has been fielded approximately every five years since inception in 1981. The survey uses population registries to recruit nationally representative samples. The WVS attempts to take into account large urban areas to prevent oversampling. Target sample size for each nation is at least 1,000 respondents. Everyone in a nation 18 years or older is eligible. The main interview mode is face-to-face, though individuals who live in remote areas often are asked to participate via phone. The survey is conducted in the respondent's native language.

Based on prior literature, we created three measures of perceived inequality utilizing the WVS. The first asked respondents, on a scale of 1 to 10, if incomes should be made more equal or if a larger income gap is required as an incentive (World Values Survey, 2014). We coded our variable 1 for respondents who answered 1 to 5 (i.e., income should be made more equal) and 0 otherwise. This question and similar questions from other surveys have been utilized to measure overall perceived inequality and to account for distributive justice (Bhuiyan & Szulga, 2017; Kerr, 2014; Murthi & Tiongson, 2009; Schneider & Valet, 2017). Therefore, not only are we more closely measuring the theoretical concept of perceived inequality as an explanation for higher homicide rates, but we are also able to take into account that perfect income equality in a population is not, on average, desired by respondents (as established by previous literature, see Norton & Ariely, 2011; Alesina, Di Tella, & MacCulloch, 2004; Guillaud, 2013; Luttens & Valfort, 2012; Toth & Keller, 2011; Yamamura, 2012).

The second question from the WVS was "People sometimes describe themselves as belonging to the working class, the middle class, or the upper or lower class. Would you describe yourself as belonging to … " Options included upper class, upper middle class, lower middle class, working class, and lower class (World Values Survey, 2014). To create a measure of class-based perceived inequality we divided the number of respondents who identified as lower class by the number who identified as upper class. The third question asked respondents to report their income on a scale of 1 (lowest) to 10 (highest). To create a measure of income-based perceived inequality we divided the number of respondents who answered 1 by the number who answered 10. We derived the class- and income-based measures of perceived inequality from prior research exploring the relationship between inequality and happiness (Macunovich, 2011).

The ratio of respondents in the self-classified lower class/income status versus those in the higher class/income status is often utilized as a measure of perceived inequality (Asthana et al., 2004; Macunovich, 2002, 2011; Smyth & Qian, 2008). While this measure is likely the weakest of our measures of perceived inequality, it does have strengths meriting its inclusion for consideration. The first is that it is similar to what scholars discuss when they describe perceived inequality. The questions ask respondents to classify themselves based on their perceptions, allowing them to self-define, instead of a more objective measure that would classify them based solely on their income. Economists have argued that subjectively allowing respondents to classify themselves on class or income provides a stronger measure of subjective inequality because people are more sensitive to class differences (Macunovich, 2011). Instead of asking respondents an abstract question (e.g., should income be made more equal?), the question asks respondents their actual perception of their income and social status. The ratio of respondents' perceived incomes and social statuses is similar in construction to other objective measures of income inequality (e.g., 20–20 ratio).

We also utilized a second international survey to measure perceived inequality. The ISSP conducts international surveys exploring various rotating themes dating back to 1985. We utilized the 2009 wave, *International Social Survey Programme: Social Inequality IV* (2012), to obtain measures of perceived inequality. For most nations the ISSP interviews individuals aged 18 and older.[7] The ISSP obtains samples with different methods in each nation. In some nations a partly simple random sample is used and in others a partly multi-stage stratified sample is used. Interview mode also varies and includes CAPI face-to-face interviews, paper surveys, and mailed surveys. The survey is conducted in the respondent's native language.

This final measure of perceived inequality combines multiple measures from the economic, social psychology, and sociology literatures. By combining questions from the ISSP into an index we allow each question to build on the strengths and fill in the weakness of the other variables in the index. Specifically, we utilized questions about income differences being too large (used by Hadler, 2005; Kenworth & McCall, 2008;

[7]A few nations included slightly different age ranges for their samples for the ISSP, including Finland (15–74), Italy and Japan (16 and older), Norway (19–0), and Sweden (17–79).

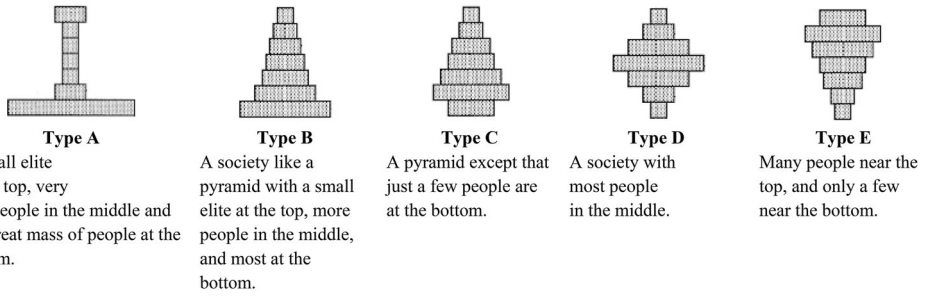

Figure 2. International Social Survey Program, 2008 p. 13.
Note: From International Social Survey Programme: Social Inequality IV.

Kerr, 2014; Lübker, 2004, 2007; Medgyesi, 2013; Suhrcke, 2011), whether the government is responsible for reducing income differences (used by Guillaud, 2013; Luttens & Valfort, 2012; Toth & Keller, 2011; Yamamura, 2012), and the observation of the actual income distribution within a nation (used by Nieuhaus, 2014, and a similar measure by Norton & Ariely, 2011).

The question asking respondents if the government should be responsible for reducing income differences takes into account socio-cultural historical influences and is commonly used when examining cross-national perceived inequality. This question measures not only if income differences exist (otherwise why would the government need to address them?) but if the income differences are a source of frustration (and thus aggression, according to theory).

The final element of the perceived inequality index asks respondents to identify their national income distribution. This is a direct measure of perceived inequality (Nieuhaus, 2014; Norton & Ariely, 2011 utilized a similar scheme), as respondents choose the diagram they believe best represents the income distribution in their nation. The diagrams from which respondents select are shown in Figure 2. Type A in Figure 2 reflects what would be expected with typical notions of inequality, with very few people receiving most of the total income at the top of the distribution and many people at the bottom of the distribution receiving very little of the total income.

Control variables

We included several control variables based on previous research. We used infant mortality as a proxy for poverty (Paré & Felson, 2014; Pridemore, 2008, 2011). We included the sex ratio (i.e., males per 100 females) to control for gender balance. To measure education we used the education component of the Human Development Index, which provides mean and expected years of schooling (United Nations, 2015). We included the unemployment rate as a measure of general economic well-being within a nation, using the World Bank's definition of the percent of the labor force that is not employed, but is able to work and seeking employment. In sensitivity analyses described below we included several other control variables.

Analyses

Our first step was to conduct exploratory data analysis. We used the Shapiro-Wilk test, quantile-quantile normal plots, and Tukey's ladder to determine if variables were approximately normally distributed. Homicide victimization rate, infant mortality, unemployment, and the WVS class- and income-based measures of perceived inequality were not normally distributed. Each became approximately normal after applying a natural logarithmic transformation. The percent of respondents who reported income differences were too large in their nation, the percent who said the government was responsible for reducing income inequality, and the percent who answered their nation looked like Type C, D, or E from Figure 2 also were not approximately normally distributed. Squaring these variables resulted in approximately normal distributions.

Next we considered reducing the perceived inequality measures into a latent variable. We could not reduce responses from all WVS and ISSP questions into a single factor but we were able to create two factors from the ISSP measures. The first, a 3-variable perceived inequality factor, included the percent of respondents who believed the difference in income was too large, that government is responsible for reducing income inequality, and their nation looked like Type A in Figure 2 (i.e., small elite at the top, very few people in the middle, and the great mass of people at the bottom). The factor had an eigenvalue of 2.10 and a Kaiser-Meyer-Olkin value of 0.70. The second factor, a 4-variable perceived inequality factor, contained the three measures just mentioned plus the percent of respondents who stated their nation looked like Type E in Figure 2 (i.e., many people near the top and only a few near the bottom). This factor had an eigenvalue of 2.21 and a Kaiser-Meyer-Olkin value of 0.72. We utilized the Bartlett method to score the factor variables.

We used multiple linear regression to test the association between perceived inequality and homicide rates. We tested for homoscedasticity, multicollinearity, and influential cases. We also used a series of quantile regressions to ensure the results of our multiple linear regression models were consistent across the entire distribution of homicide victimization. Previous research by Santos, Testa, and Weiss (2018) suggested that the associations with national homicide rates of income inequality (measured by the Gini Coefficient) and poverty may vary across the distribution of homicide victimization.[8]

Results

Table 2 provides the correlation matrix and descriptive statistics for all variables. The two ISSP factors were perfectly correlated with each other, thus we used the more parsimonious 3-variable factor. Otherwise, the strongest correlation between perceived inequality measures was for the ISSP 3-variable factor and the WVS income-based measure ($r = 0.55$). No measure of perceived inequality was significantly correlated

[8]We used both Stata and R for the quantile regressions. In Stata we utilized the simultaneous-quantile regression command that uses bootstraps to generate an estimate of the standard error. To ensure perfect replication we set the seed at 223. In addition, we set the repetitions at 1000. In R, we utilized the quantile regression function to create the quantile regression plots presented in Figure 1. The Stata and R quantile regressions were similar within a few decimal places.

Table 2. Correlation matrix and descriptive statistics.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Ln homicide	–											
2. Income should be more equal	−0.03	–										
3. Social class-based perceived income inequality	0.18	0.00	–									
4. Income-based perceived income inequality	0.07	0.32	**0.39**	–								
5. Perceived inequality (3-variable) factor	0.21	0.15	0.31	**0.55**	–							
6. Perceived inequality (4-variable) factor	0.21	0.15	0.31	**0.55**	**1.00**	–						
7. Ln poverty (infant mortality)	**0.74**	−0.16	0.23	0.12	0.22	0.22	–					
8. Sex ratio	−0.13	**−0.25**	−0.12	−0.21	**−0.46**	**−0.47**	0.02	–				
9. Education	**−0.53**	**0.42**	**−0.41**	−0.12	**−0.33**	**−0.32**	**−0.64**	−0.09	–			
10. % Urban	**−0.26**	**0.23**	−0.31	−0.22	**−0.38**	**−0.38**	**−0.48**	0.19	**0.68**	–		
11. Ln unemployment	**0.28**	0.06	−0.08	0.15	**0.43**	**0.43**	**0.39**	**−0.40**	0.00	−0.09	–	
12. Gini	**0.57**	0.05	0.06	−0.06	0.03	0.03	**0.60**	0.03	**−0.45**	0.17	0.11	–
Mean	1.04	47.78	21.41	13.67	0.00	0.00	−0.35	100.15	0.67	64.08	2.02	34.00
SD	1.21	15.79	42.24	18.07	1.05	1.05	0.64	18.40	0.16	22.24	0.64	6.00

Note: **Bold $p < 0.05$**.

with (1) the Gini coefficient of income equality, suggesting it is not capturing the perceived inequality theoretical construct driving the main explanation of inequality and violence, (2) poverty, which is important because the Gini index is usually highly correlated with poverty (here, $r = 0.60$, which is the highest correlation for the Gini index), yet to parse their effects requires distinct measures of absolute and relative deprivation, or (3) cross-national homicide rates.

Table 3 shows regression results. None of the measures of perceived inequality were associated with homicide rates.[9]

We conducted multiple sensitivity analyses to ensure the stability of our results. First, we considered several alternative structural covariates of homicide and model specifications to be sure our findings for perceived inequality were not a function of the variables we chose to include in the model. We included gross domestic product, included the Gini coefficient, removed unemployment, removed poverty, removed the education index, and examined each of the WVS and ISSP variables individually. In none of these many models was there an association between perceived inequality and cross-national homicide rates.

Second, we tested for heteroscedasticity using the Breusch-Pagan and Cook Weisberg tests. All models were homoscedastic. Third, we tested for multicollinearity using variance inflation factors (VIFs). The largest VIF across all models was 2.60. VIFs of this magnitude rarely pose a threat, but to be safe we removed variables with VIF $\geq$ 2. When we did so we found no association between perceived inequality and homicide rates. Fourth, we reduced all control variables into components utilizing principle component analysis, and when we included these in the models the overall conclusions about perceived inequality and homicide remained the same.

Fifth, we used DFBETAS, DFFITS, covariance ratios, studentized residuals, leverage values, diagonal elements of the hat matrix, and Cook's distance to gauge the effect of outliers. All diagnostics indicated Trinidad and Tobago was an outlier with enough leverage to bias results. Removing any of the other nations that were outliers did not change the conclusions about the association between perceived inequality and cross-national homicide rates. Sixth, we carried out post-hoc power analysis with Cohen's (1988) equation, using the adjusted R^2 to obtain slightly more conservative estimates. Table 3 includes the results. Power for all models was $\geq$0.98, which was not surprising given the size of the adjusted R^2s.

Next we used Sequential ANOVAs, which is a variation on Tukey's sweeping out method (Hoaglin, Mosteller, & Tukey, 1983), to determine if the Gini coefficient had any explanatory power net of poverty. In a model that includes only the Gini coefficient and a measure of poverty, both (Gini: $F = 16.54$, $p < .001$; poverty: $F = 12.58$, $p = .001$) account for a significant proportion of the variance. When the order is switched, however, allowing poverty the first chance to account for variation in homicide rates, only poverty ($F = 26.82$, $p < .001$) remains significant and there is a dramatic reduction in the F-statistic ($F = 2.30$, $p = .141$) for the Gini coefficient. This means that

[9]We also examined models including the Gini coefficient as an additional variable. The overall conclusions remained the same, and the Gini coefficient was not significantly associated with homicide victimization as long as we included a measure of poverty in the model. This was true even when the model included only three variables (perceived inequality, Gini, and poverty). We do not present results here because the sample size decreases to 22–29 nations due to missing data.

Table 3. Multiple linear regression results for perceived inequality and homicide victimization rates.

	Model 1: Income more equal			Model 2: Social class based			Model 3: Income class based			Model 4: Perceived income inequality (3-variable) factor		
	b	se	p	b	se	p	b	se	p	b	se	p
Perceived inequality	0.01	0.01	0.12	−0.01	0.01	0.37	0.00	0.01	0.72	−0.04	0.18	0.81
	(0.15)			(−0.10)			(−0.04)			(−0.04)		
Ln poverty (infant mortality)	1.35	0.24	<0.01	1.37	0.26	<0.01	1.37	0.26	<0.01	1.18	0.30	<0.01
	(0.72)			(0.76)			(0.72)			(0.63)		
Sex ratio	−0.03	0.02	0.07	−0.04	0.02	0.03	−0.04	0.02	0.04	−0.10	0.04	0.02
	(−0.20)			(−0.27)			(−0.26)			(−0.38)		
Education index	−3.30	1.59	0.04	−3.20	1.74	0.07	−3.36	1.69	0.05	−2.01	2.80	0.48
	(−0.25)			(−0.25)			(−0.25)			(−0.12)		
% Urban	0.01	0.01	0.49	0.01	0.01	0.22	0.01	0.01	0.42	0.03	0.01	0.04
	(0.07)			(0.15)			(0.09)			(0.31)		
Ln Unemp	−0.32	0.22	0.16	−0.31	0.24	0.21	−0.36	0.24	0.15	−0.05	0.39	0.89
	(−0.15)			(−0.16)			(−0.17)			(−0.02)		
Constant	6.80	2.51	0.01	8.15	2.61	<0.01	8.42	2.63	<0.01	10.70	5.15	0.05
F	13.78			11.05			11.93			9.51		
R^2	0.65			0.63			0.65			0.67		
Adj R^2	0.60			0.57			0.59			0.60		
Power	0.99			0.99			0.99			0.98		
N	52			46			46			35		

Notes: Standardized Betas in parentheses. We estimated power post hoc based on Cohen's (1988) formula, though we utilized the adjusted R^2 to be more conservative.

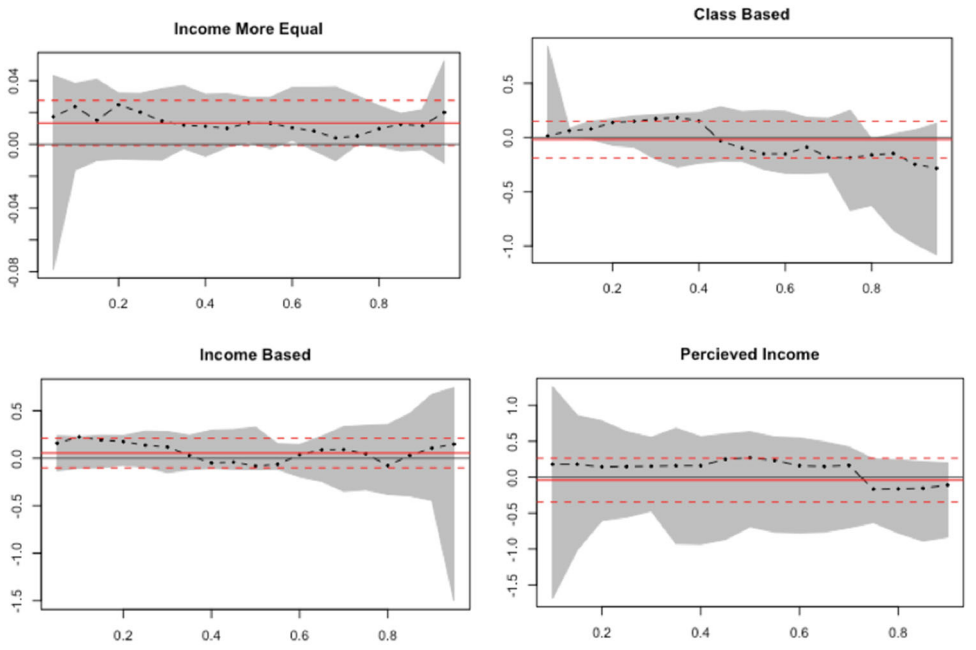

Figure 3. Quantile regression plots for perceived inequality measures.
Note: We created each of the figures from a quantile regression ranging from 0.05 to 0.95 at 0.05 intervals. The additional variables included in the model are the same as those in the representative models in Table 3. The y axis is the natural logarithmic transformed homicide victimization and the x axes are the various quantile levels.

poverty accounts for more variation in homicide rates beyond any shared variation with the Gini coefficient. The Gini coefficient, on the other hand, does not account for any more variation in homicide rates beyond that of poverty.

Finally, Figure 3 provides the graphical representation of the quantile regressions from R for each of the perceived inequality measures.[10] The solid line is what the regression coefficient estimate would be for the model, and the dotted lines are the 95% confidence interval around the estimate. The dot-solid lines are the estimates for each of the coefficients at each quantile (from 0.05 to 0.95, at 0.05 intervals). The grey area is the 95% confidence interval around the quantile coefficients. Quantile regression is only useful when the estimates of the coefficients at the quantiles are significantly different from the estimates of the coefficient for the multiple linear regression. When the estimate of the coefficient for the quantiles falls completely within the 95% confidence interval for the coefficient from multiple linear regression, quantile regression is not useful and should not be utilized over multiple linear regression.

We generated quantile regression plots for the models presented in Figure 3, and by substituting in the Gini coefficient for unemployment for the models in Table 3. Across all 8 quantile regression plots (and the various quantile regression models both in R and Stata) there was no evidence to indicate that the quantile regression

[10]All data, log files, syntax files, and complete figures are available via https://sites.google.com/site/homicidedata/perceived-inequality-and-cross-national-homicide-rates.

estimates are significantly different from those from the multiple linear regression for the bulk of the sample. In the very extremes (quantile greater than 0.95) of homicide victimization, there are a few incidences where the estimated coefficient for poverty is significantly different, but often significantly higher than what was estimated in a multiple linear regression model. These observations are different from the conclusions drawn by Santos et al. (2018). The differences are likely due to (1) poor model specification by Santos et al. (2018), specifically multicollinearity between percent young, infant mortality, the education index, and the Gini coefficient, and (2) Santos et al.'s failure to check if their quantile regression results were significantly different from those of a multiple linear regression. The entire point of a quantile regression analysis is to measure the differential effect of predictor variables across the distribution of the outcome variable. If the quantile regression does not have significantly different conclusions from the multiple linear regression, then the multiple linear regression should be utilized over quantile regression because of the importance of parsimony in statistical analyses.

Discussion

A better understanding of why interpersonal violence rates vary dramatically between nations provides insight into the nature of social structure, culture, and crime. While research on economic inequality and violence from the United States is largely inconclusive, this association is among the most consistent in cross-national homicide studies. Scholars mainly explain the association via a social psychological process of perceived unfair inequality leading to frustration and eventually to aggression. However, there are theoretical and empirical limitations to the frustration-aggression explanation. Theoretically, an individual level explanation of a population level finding is reductionist. Empirically, in spite of dozens of studies carried out over decades the hypothesis has not actually been tested because the Gini coefficient does not measure the theoretical concept of perceived inequality.

We provide important contributions to the literature on why societal interpersonal violence rates vary because we address these key theoretical and methodological weaknesses and use improved measures of perceived inequality. We address the theoretical limitation of a reductionist explanation by reconceptualizing the theoretical construct of perceived inequality as a population-level characteristic. We address the methodological limitation of a questionable measure of the theoretical concept by employing much more direct measures of perceived inequality among residents. Our conceptualization and measurement bring the criminological and cross-national homicide literatures into congruence with a larger body of population-level research on inequality from other disciplines. Our results do not provide support for the hypothesis of an association between perceived inequality and national homicide rates.

The Gini coefficient and perceived economic inequality

The Gini coefficient, which is a statistical measure of the dispersion of income or wealth distribution in a population, is not a valid operationalization of the theoretical

concept of perceived inequality. This is true whether perceived inequality is defined as a characteristic of individuals or of nations. Nor does the Gini coefficient measure if economic inequality in a nation is perceived to be unfair, rooted for example in ascribed status (Blau & Blau, 1982) or blocked opportunities (Messner, 1982). Thus, while the persistent population-level associations between the Gini coefficient and homicide rates in dozens of studies over decades may provide information for the scientific record in this area of research, they are not evidence for an explanation based on perceptions of unfair inequality that create frustration and in turn generate aggression.

In addition to this conceptual disconnect between a theoretical construct and its measure, methodologically "perceived inequality differs from true inequality across countries" (Bublitz, 2016, 9). Residents not only generally underestimate economic inequality, but this underestimation varies by nation (Engelhardt & Wagener, 2014; Kiatpongsan & Norton, 2014). Further, societies with similar Gini coefficients can have very different levels of "unfair" inequality, a key element of the frustration-aggression thesis. Potential reasons for differences in perceived inequality, perceived unfair inequality, and demand for redistribution include level of development, type of political economic system, social protection programs that offset income inequality, and cultural values about income and its distribution (Alesina & Angeletos, 2005; Anderson & Yaish, 2012; Andress & Heien, 2001; Kerr, 2014; Medgyesi, 2013; Svallfors, 2010). While some research shows an association between the Gini coefficient and individual items from the World Values Survey and International Social Survey Programme (Kelly & Evans, 2017), other findings show no impact of the Gini coefficient on residents' attitudes to inequality (Hadler, 2005). We found very weak correlations ($r \leq |.06|$) between the Gini coefficient and our WVS and ISSP indicators of perceived inequality.

All this calls into question the perceived inequality and frustration-aggression explanations of any association between the Gini coefficient and national homicide rates. It also illustrates individuals often misperceive social structural conditions, making it vital not to assume, but when possible to measure, the overlap between actual and perceived phenomena.

Conceptualizing and measuring perceived inequality as a population-level characteristic

While the social psychological process of frustration-aggression remains the predominant justification for a possible cross-national relationship between economic inequality and homicide rates, many scholars recognize the problem of assigning an individual-level explanation to a population-level outcome, association, or phenomenon. It is not difficult to conceive of perceived inequality as a population characteristic. We can imagine residents of different neighborhoods or nations vary on their level of perceived inequality just as other research on homicide reveals areas vary on their level of social disorganization (Sampson & Groves, 1989), collective efficacy (Sampson, Raudenbush, & Earls, 1997), and social capital (Messner, Baumer, & Rosenfeld, 2004). We can imagine that areas with greater perceived economic inequality linked to class or ethnic conflict, illegitimate governments, or fierce competition for resources might

experience more interpersonal violence. Our simple reconceptualization offers a potential population-level explanation for a population-level outcome. While our study is among the first in the cross-national homicide literature to conceptualize perceived inequality as a population-level characteristic, what we suggest is not new. We drew on a growing theoretical and empirical literature, mostly in economics and political science, on perceived inequality and how it varies by nation.

Specific measures of *perceived* inequality are also required because research reveals several societal characteristics—apart from only the actual distribution of income or wealth—influence perceived inequality, tolerance for inequality, and demand for resource redistribution. We used items from the *World Values Survey* and the *International Social Survey Programme* to gauge these attitudes and values by nation, which accord much more closely with the theoretical concept of perceived inequality than measures of income or wealth distribution like the Gini coefficient, the 20–20 index, and related indicators. Research in other fields already showed the utility of WVS and ISSP items to gauge perceived inequality, and our analysis shows substantial national variation on our five indicators (see standard deviations in Table 2). Prior research using the Gini coefficient also was plagued with high correlations with measures of poverty, thus confounding empirical indicators of competing theoretical economic explanations. Our measures of perceived inequality were all weakly correlated with our measure of poverty ($r \leq 0.23$), providing discriminant validity and more discrete estimates.

In sum, we traded an individual-level concept for a population-level concept and used surveys of nations' residents for specific measures of the latter. These steps provide a cleaner test of the hypothesis that nations with higher levels of perceived inequality have higher homicide rates.

No evidence of an association between population perceived inequality and homicide rates

The results shown in Table 3 provide no support for the hypothesis that perceived inequality and national homicide rates covary. Further, our discussion of our sensitivity analyses showed we tested this association several more times using alternative model specifications, and in no instance was there an association. We believe the hypothesis of a national level association between perceived inequality and homicide rates has not actually been tested until now because of the theory and measurement limitations outlined above. This makes ours the first or one of the first tests of this association at the population level. When our findings are considered in the context of the prior limitations and with recent results revealing instability of the cross-national association between the Gini coefficient and homicide rates when controlling for poverty (Paré & Felson, 2014; Pridemore, 2008, 2011; see also, Baumer & Wolff, 2014; Rogers & Pridemore, 2013), evidence for the influence of perceived inequality diminishes further.

It is not only homicide

Over the last decade a range of other population-level outcomes believed to be associated with economic inequality have come under scrutiny. Support for inequality's

impact on population health (Jen, Jones, & Johnston, 2009; Mackenbach, 2002), mortality (Muller, 2002), and happiness, well-being, and life satisfaction (Bjørnskov, Dreher, Fischer, Schnellenbach, & Gehring, 2013; Zagorski, Evans, Kelley, & Piotrowska, 2014) is not as clear as commonly thought (Kelly & Evans, 2017). Inequality is also accepted by many as a cause of political violence, yet the empirical literature shows the effects of economic and related inequalities on civil war and rebellion is not a settled matter (Collier & Hoeffler, 2004; Fearon & Laitin, 2003). To be clear, there is a large body of careful research revealing health inequalities and the negative effects of income, ethnic, and other types of inequality, especially on individual and self-rated health. However, the impact of perceived inequality, especially via frustration-aggression, on national homicide rates does not appear to be as convincing as many believe, and the uncertain evidence for this association is consistent with the inconclusive effects of population inequality on other negative population outcomes.

Other explanations for a population-level association?

Some studies continue to find an association between the Gini coefficient and national homicide rates (Elgar & Aitken, 2011; Messner, Raffalovich, & Sutton, 2010). If we assume this association is not due to measurement or method, what might be causing the association?

There are many reasons violence rates might be sensitive to population-level economic inequality other than frustration-aggression or competition for scarce resources. Currie (1997) argued that over time market societies become hardened to deprivation and inequality and therefore reduce the amount of social protection provided to residents. This would mean lower public expenditures on things like quality public education that might be associated with crime rates (Dunn, Burgess, & Ross, 2005). Income disparity also may generate feelings of distrust among groups in a population that create more aggression (Elgar & Aitken, 2011). It might similarly devalue the legitimacy of the state, which could reduce informal and formal social control or make some segments of the population skeptical of using the law as a mechanism of dispute resolution (Cooney, 1997; LaFree, 1998; Nivette & Eisner, 2013).

Each of these explanations is rooted in substantial theorizing and sometimes in empirical findings. Each deserves to be tested more definitively. The problem is that an association between the Gini coefficient and cross-national homicide rates (or other population-level outcomes) tells us little about which if any of these different explanations is correct. Instead, we require greater precision in measuring these theoretical concepts and greater care in testing the pathways through which they might influence national homicide rates.

Limitations

One limitation of our analysis is sample size. This stems from our desire to use a valid measure of the dependent variable. We utilized the WHO Mortality database to obtain measures of homicide victimization across nations, but this comes at the cost of a smaller sample size. We believe that the understandable desire to increase sample size

is driving some scholars to employ invalid homicide estimates. For example, alternative sources like the *Global Homicide Report* caution scholars against using the data to make comparisons of homicide across nations or time due to severe limitations in how data are collected, how missing data are replaced, and many other concerns addressed by Kanis et al. (2017).

Second, we created our measures of perceived inequality utilizing surveys conducted across multiple nations. While these surveys are used widely in other literatures, they are relative new to criminology. Recognizing this, we used specific measures employed by scholars in other fields and published in reputable peer-reviewed journals. As per the usual path of scholarly work, further research is required to build upon these measures of perceived inequality or to provide alternatives that fit the theoretical concept. Possibilities include utilizing Item Reponse Theory to allow for individual-level variation to be maintained during the generation of a factor variable.

Finally, we are not saying inequality does not matter at all for national homicide rates. Instead, we are pointing out that the theoretical mechanism most often utilized by scholars to justify inclusion of the Gini coefficient is not measured by the latter. As with the previous literature, we are unable to discern if the lack of an association between the Gini coefficient and homicide rates is due to omitted variable bias or to multicollinearity. However, we can say with certainty that the Gini coefficient does not measure perceptions of inequality within nations. Similar to research in other disciplines that more often address cross-national outcomes, we did not find a significant correlation between the Gini coefficient and our measures of perceived inequality. This should not be a surprise, as individual and group perceptions often do not reflect reality. For an example easily understandable to criminologists, we need only look to the public perception of the level and trend in violence rates in the United States over the last few decades.

Conclusion

Severe economic inequality is a destructive social force that results in negative individual, group, and population-level outcomes. Recent empirical scrutiny in multiple fields, however, suggested inequality's direct effects on some outcomes are more circumscribed than once believed. We attempt to reorient thinking about perceived inequality to consider populations instead of individuals and we employ much more precise measures of this theoretical concept. Our findings consistently show no effect on national homicide rates of perceived inequality.

National homicide rates are a social fact. Recent years generally have seen a narrowing of the study of causes of violence to focus on individual explanations. However, it is implausible that the tremendous variation in national homicide rates is explained by individual-level processes. Social structure and culture matter. Rates of interpersonal violence speak to deep-seated elements of social organization, thus investigating the national characteristics associated with variation in population-level crime rates is an essential criminological enterprise.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix: Variables, definitions, and sources

Variable	Definition	Source
Ln homicide	(Number of homicides/population) * 100,000	World Health Organization (WHO)
Income should be more equal WVS	Percent of respondents who stated incomes should be made more equal vs We need larger income differences as incentives (answers 1–5)	World Values Survey (WVS)
Class based perceived income 1 WVS	Class Based (percent of respondents defined self as lower class/ percent respondents defined self as upper class)	WVS
Income based perceived income 2 WVS	Scale of income (percent respondents defined self as 1. Lower step/percent of respondent defined self as 10: Higher step)	WVS
Perceived income inequality (3-variable) factor	Factor variable of % respondents agreed difference income too large in country, percent of respondents who agreed it was the governments responsivity to reduce income differences, and the percent of the respondents who said their nation was Type A from Figure 2	WVS
Perceived income inequality (4-variable) factor[a]	Factor variable of % respondents agreed difference income too large in country, percent of respondents who agreed it was the governments responsivity to reduce income differences, and the percent of the respondents who said their nation was Type A or Type E from Figure 2	International Social Survey Programme Social Inequality IV
Ln poverty	(Number of infant deaths (<1 year)/ Number of live births) * 100	WHO
Sex ratio	Number of males per 100 females	WHO
Education index	Index of mean years of schooling and expected years of schooling	Human Development Index from the United Nations
% Urban	Percent of the population that lives in an urban area	World Bank
Ln unemployment rate	The percent of the labor force that is not employed, but is able to work and seeking employment	World Bank
Gini	Gini coefficient of income equality	UN-WIDER

[a]We do not present results for this model as the conclusions are the same as the 3-variable model.