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A Review and Analysis of the Impact of Homicide Measurement on Cross-National Research

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Abstract

The number of cross-national homicide studies is increasing rapidly. Many scholars, however, do not consider the details of how individual nations and the four main centralized homicide data sources—raw estimates from the World Health Organization (WHO) Mortality Database, adjusted estimates from the WHO Global Health Observatory, United Nations Office on Drugs and Crime, and World Bank World Development Indicators—generate national homicide rates and the impact this may have on results and the scientific record. We tested whether homicide trends, levels, and structural covariates are dependent on data source. We used 1990–2018 data in 5-year groupings and pooled them over time and nation. We utilized exploratory data analysis techniques to look for differences in homicide rates and trends. Then we employed seemingly unrelated regression (SUR) to determine whether associations with homicide of typical structural covariates were dependent on homicide data source. Finally, we examined Wald Tests to determine whether differences in the sizes of the SUR coefficients from each data source were significantly different from zero. We found differences in homicide trends and rates by data source and that associations with homicide rates of structural covariates varied in significance, magnitude, and even direction depending on homicide data source. Cross-national homicide

research has a promising future for understanding short- and long-term global and regional trends and population-level covariates and constructing theoretical explanations for geographical and temporal variation. However, researchers must better understand how national homicide data are generated by nations and these four data sources. All four systems possess limitations, but homicide data from the WHO Mortality Database present the most attractive option.

INTRODUCTION

The number of cross-national homicide studies is increasing rapidly. From 2016 to May 2021, 41 studies of the structural covariates of cross-national homicide rates were published in peer-reviewed journals. To put this in perspective, beginning in 1974 it took until 2001, or nearly 28 years, to reach the 41st peer-reviewed study. Although there are multiple extensive reviews of this literature (Kim et al. 2020, Koeppel et al. 2013, Lynch & Pridemore 2011, Nivette 2011, Pridemore & Trent 2010, Rogers & Pridemore 2018, Trent & Pridemore 2012), they and the primary literature often ignore the potential implications on research of how homicide rates from each main data source are generated and the definitional and methodological differences between them. Although scholars often treat these sources interchangeably and assume they are of equal quality for this type of research, this is not the case. Similarly, a common practice is to employ a particular source, and perhaps even combine sources, to maximize sample size. Unfortunately, this is done at the expense of data reliability and validity. Over thirty years ago, Bennett & Lynch (1990) asked an important question—"Does a difference make a difference?"—to understand whether selecting different cross-national crime data sources affected a study's conclusions. Ultimately, they concluded that a difference did not make a difference. Since that time, however, data sources and collection methods have changed and deserve further scrutiny.

Although there is some recognition of differences in data quality, there are few studies that explore the details of how these sources generate their homicide data for nations and whether the selection of one relative to others has an impact on research outcomes (Kanis et al. 2017). Frantz (2019) and Dawson (2017, 2018) employed multiple homicide measures to ensure their results were not an artifact of the homicide data employed. They discovered differences across their models, but those differences could not be attributed solely to the data source, as their samples of nations also varied across their models. In this article, we first briefly describe the four centralized sources that currently provide cross-national homicide data, focusing on how they define homicide, from where they obtain national data, and how they calculate the national homicide rates they publish. We then test if a difference makes a difference via both exploratory data analysis and inferential analyses. Our findings led us to conclude that a difference often does make a difference, that selection of homicide data source can have a meaningful impact on results of cross-national homicide research.

LITERATURE REVIEW

There are four sources of cross-national homicide data: the World Health Organization (WHO) Mortality Database (WHO Mort), the WHO's Global Health Observatory (GHO), the United Nations Office on Drugs and Crime (UNODC), and the World Bank World Development Indicators database (WB). There is an additional fifth option, although it is a multisource index (Marshall & Block 2004). Two of the four sources are nearly the same because metadata from WB describe that its figures come directly from the UNODC homicide data (World Bank 2021b). **Figure 1**, which presents the natural log of the average annual homicide rate from 1990 to 2019,

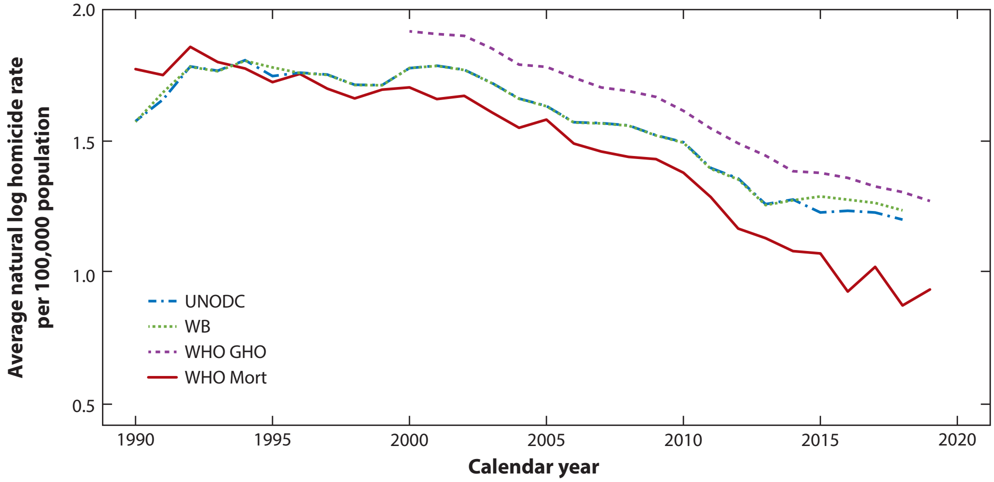

Figure 1

Yearly average of 1990–2019 homicide rates for United Nations Office on Drugs and Crime (UNODC), World Bank World Development Indicators database (WB), World Health Organization Global Health Observatory (WHO GHO), and World Health Organization Mortality Database (WHO Mort). The sample of nations for this graph is limited to nations that had data available from all four sources ($n = 53$).

shows this overlap is perfect except for 2014–2018 and a couple of earlier years (1991 and 1995). **Figure 1** also shows the GHO consistently reports the highest homicide rates. WHO Mort tends to report the lowest homicide rates, with the exception of the 1990–1994 period. The divergence in the reported homicide rates by source appears to have grown since 2010. Scholars often fail to scrutinize the metadata descriptions of where and how homicide data from each source are collected. **Table 1** summarizes the sources of cross-national homicide data, years for which data are available, definitions, and other relevant information.

World Health Organization Mortality Database

The World Health Organization Mortality Database (WHO 2021a) provides homicide victimization data for several nations from 1950 to 2020. WHO classifies homicide deaths utilizing the International Classification of Diseases (ICD) codes. ICD codes are currently in the tenth revision, with the eleventh soon to arrive. Scholars must pay close attention to which ICD codes are employed, as different codes may be utilized within the same WHO mortality raw data file. The documentation file provided on the WHO Mortality Database website furnishes the information necessary to obtain the correct ICD codes for each of the currently available raw data files.

WHO employs civil death registrations to count deaths (WHO 2021b). Historically, WHO has conducted audits if death certificates within a nation were questionable, and it does not report a nation's homicide rate if it deems its data unreliable. The WHO Mort utilizes only medically certified deaths and thus does not include in these data causes of death diagnosed by nonmedical personnel. By employing the uniform definitions of the ICD codes, WHO improves construct validity by limiting measurement error due to differences in homicide definitions across nations.

Some scholars confuse the WHO Mort and WHO's GHO database. The former does not provide any corrections for missing data, upweight homicide counts within nations, or include homicide data reported by UNODC (WHO 2021b). In short, the WHO Mort does not use any other information to adjust or impute homicide counts.

Table 1 Summary of homicide data sources for cross-national samples

Source	World Health Organization Mortality	United Nations Office on Drugs and Crime	World Bank World Development Indicators	World Health Organization Global Health Observatory
Years	1950–2019	1990–2018	1990–2018	2000–2019
Definition	ICD codes (precise code varies across ICD code revisions). A homicide is the killing of a person by another with intent to cause death or serious injury. Infanticide should be included. Cases where the perpetrator was merely reckless or negligent should be excluded	Unlawful death inflicted upon a person with the intent to cause death or serious injury Inclusions: murder; honor killing; serious assault leading to death; death as a result of terrorist activities; dowry-related killings; femicide; infanticide; voluntary manslaughter; extrajudicial killings; killings caused by excessive use of force by law enforcement/state officials Exclusions: death due to legal interventions; justifiable homicide in self-defense; attempted intentional homicide; homicide without the element of intent in nonintentional homicide; non-negligent or involuntary manslaughter; assisted suicide; illegal feticide; euthanasia	Intentional homicides are estimates of unlawful homicides purposely inflicted as a result of domestic disputes, interpersonal violence, violent conflicts over land resources, intergang violence over turf or control, and predatory violence and killing by armed groups. Intentional homicide does not include all intentional killings; the difference is usually in the organization of the killing. Individuals or small groups usually commit homicide, whereas killing in armed conflict is usually committed by fairly cohesive groups of up to several hundred members and is thus usually excluded	ICD codes (precise code varies across ICD code revisions). A homicide is the killing of a person by another with intent to cause death or serious injury. Infanticide should be included. Cases where the perpetrator was merely reckless or negligent should be excluded
Data collection	Civil registration	Data collected from national authorities through the annual UN-CTS. Additional data are sourced from the most reliable sources available	NA	The estimates of homicide rates draw on data provided by countries from police and vital registration sources; data from UNODC homicide information (weighted); and data from WHO's Mortality Database. The estimation process used observed data on homicide rates, in conjunction with regression modeling for countries without sufficient data availability or quality, to compute comparable estimates of homicide rates and numbers across countries
Metadata		Varies by nation and year	UNODC International Homicide Statistics database	Varies by nation and year
Adjusted or imputed	No	Yes (see bulk data download)	Yes	Yes
Website	**https://www.who.int/data/data-collection-tools/who-mortality-database**	**https://dataunodc.un.org/**	**https://databank.worldbank.org/source/world-development-indicators**	**https://www.who.int/data/gho/data/indicators/indicator-details/GHO/ghe-estimates-of-number-of-homicides**

Abbreviations: ICD, International Classification of Diseases; NA, not available; UN-CTS, United Nations Crime Trends Survey; UNODC, UN Office on Drugs and Crime, WHO, World Health Organization.

One limitation of the WHO Mort is that the data are not user-friendly. Although historically this was not the case, WHO discontinued the user-friendly version of the Mortality Database. Utilizing these data requires scholars possess knowledge of the different historical ICD codes, although WHO makes most of the relevant codes available in its documentation. Scholars must also know how to merge and append data in their statistical software of choice. Another complication is that the Mortality Database may report the same homicide rates across different revisions of the data within the most recent ICD codes. This is an issue with the ICD-10 files (ICD-10, Parts 1–5). There are 2,020 repeat observations across Parts 2–5 of the ICD-10 files. One must properly collapse the homicide data so that the latest version of the ICD-10 files is utilized for the national count of homicide victimizations. For example, 2018 homicide data for the Republic of Moldova were available in both Part 2 and Part 5 of the ICD-10. If scholars are not careful when merging the data, they will double count Moldova homicides in 2018.

Another limitation is that many nations do not report homicide data to WHO consistently or at all. Thus, utilizing the WHO Mortality Database results in a smaller sample. The erratic reporting could influence research, and Messner (1992) found that for nations that do not report data regularly, utilizing a limited time frame could affect the conclusions of a study. The sample is also regionally biased, as most nations that typically report are European and North American nations, with a handful of nations in South America, Asia, and the South Pacific also reporting regularly, and only one or two nations from the African continent consistently reporting. Thus, WHO Mort homicide data availability is correlated generally with development and with cultural regions, both of which may be correlated with homicide rates. The limited sample of nations is further reduced by missing data within a nation for certain years. Most Eastern European nations, for example, began reporting only around 1990. Finally, some nations report a zero homicide count, which scholars often treat as unreliable and remove these nations from their samples.

World Health Organization Global Health Observatory

The World Health Organization's Global Health Observatory (GHO) provides homicide data for many nations from 2000 to 2019. The GHO has three methods of reporting homicide estimates: homicide deaths reported by the nation, adjusted homicide deaths, and comparable homicide estimates (WHO 2014, p. 62). GHO homicide deaths reported by nation are obtained from a survey WHO sends to nations, and in it WHO suggests multiple government sectors (e.g., Ministry of Health, Ministry of Justice, and law enforcement) should be among the respondents for each nation. For the second method, adjusted homicide deaths, GHO utilizes multiple methods to quantify biases in a nation's vital statistics collections to correct for underreporting and misclassification. Depending on how similar a nation's UNODC-reported and WHO Mort–reported homicide rates are, GHO may report the homicide rate as per the mortality data provided by nations in the survey, ignore the mortality data and instead report the homicide rate provided by criminal justice agencies to the UNODC, or adjust the criminal justice data upward by as much as 15% (due to greater homicide underreporting by law enforcement relative to vital statistics registration systems).

For the third method of reporting, GHO attempts to make homicide rates comparable across nations by using missing data techniques to impute homicide rates for nations that do not have "high-quality data on homicides" (WHO 2014, p. 62).[1] Variables employed in the imputation

[1]GHO utilizes hierarchical generalized linear models with a log link to impute homicide estimates. They argue this is a stronger method relative to multiple imputation because if a nation has no or limited homicide data then GHO informs the model about what the expected homicide rate might be based on regional and

algorithm include alcohol drinking pattern, a gender inequality index, percent of the population living in an urban area, proportion of the population that were males aged 15–30 years, religious fractionalization, and the infant mortality rate (WHO 2014, p. 65).

A serious limitation of these data for cross-national homicide research is that many of the variables GHO uses to impute homicide data are the same structural covariates scholars typically use in their models. Thus, scholars who use this source are including the same information on both sides of the statistical equation. Kanis et al. (2017) detailed this issue and the problems arising from it (see also Andersson & Kazemian 2018, LaFree 2021). Furthermore, scholars often treat the very dissimilar WHO Mort and GHO sources interchangeably in spite of the differences described here and in spite of the differences in homicide definitions across the two sources (which are similar but not identical, see **Table 1**). Similarly, the homicide definition in the ICD codes (from the WHO Mortality Database, which GHO uses) does not align exactly with national-level homicide definitions (which is what nations use when responding to the GHO survey) or the UNODC's definition (which GHO also uses) (Smit et al. 2012). In sum, in any given year national homicide rates published by GHO can include a mix of rates reported by (*a*) nations to GHO's survey, (*b*) nations to UNODC, (*c*) the WHO Mortality Database, and (*d*) GHO's imputation methods.

United Nations Office on Drugs and Crime

The UNODC (2021a) reports homicide data for many nations from 1990 to 2020. The data are collected from several sources, with each source listed in the bulk data download. The UNODC data catalog indicates that its primary source for homicide data is the United Nations Crime Trend Survey (UN-CTS), which it sends to representatives in each nation. It is unclear exactly from where each nation draws its crime data, but the UN suggests it be completed by "police or other law enforcement agencies" (United Nations 2018). In addition to the survey data collected in the UN-CTS, however, the UNODC also obtains homicide data from the WHO Mortality Database, the GHO adjusted rates described above, GHO imputed homicide rates described above, and many other within-nation sources (e.g., Attorneys General, police agencies). The UNODC replaces missing data from the UN-CTS based on the "most reliable sources available" among these other sources (United Nations 2021a). Therefore, one must determine the precise data source for each nation from the bulk downloaded file.

One central limitation of the UNODC homicide data is that there is no check to ensure each nation is using the same homicide definition when it responds to the survey. In recent years, the UNODC attempted to ensure the definition they provide is followed by each nation, but to the extent that a nation's definition differs from the UNODC, it is unlikely the nation will recalculate its counts when completing the survey to comply with the UNODC definition. The UNODC states "data have been selected which conform as much as possible to the definition of intentional homicide" (United Nations 2021a). Research indicates that nations' homicide definitions often do not overlap with the UNODC definition of intentional homicide (Smit et al. 2012). Separately, of course, the UNODC homicide definition does not match that of WHO Mort and GHO sources from which it draws. Together with UNODC's replacement of UN-CTS missing data with data from various other sources, this means that scholars employing homicide rates published by UNODC are not comparing the same things across nations.

global patterns. If data on the covariates mentioned here are missing, then GHO uses linear imputation for them. To obtain a final homicide rate estimate when data are missing, GHO employs a weighted average of the predicted homicide rates from the five best-performing models. These best-performing models are based on the leave-one-out cross-validation method, dropping one observation at a time and then calculating the root mean squared error of the predicted homicide rates (WHO 2014, pp. 64–65).

Another key limitation is the use of imputed data. The United Nations data catalog indicates that "data included in the dataset correspond to the original value provided by the source of origin, since no statistical procedure or modelling was used to change collected values or to create new or revised figures" (United Nations 2021a, p. 1), and thus it appears the UNODC is not itself adjusting or imputing data. However, the UNODC draws homicide data from the GHO and the Global Study on Homicide, and the UNODC website and bulk data download are both listed as sources for homicide data for a substantial portion of nations and years. Both also employ data adjustment techniques. Therefore, although the UNODC does not directly impute homicide rates, some of the rates they do report in any given year draw from sources that do impute data. Thus, as with GHO homicide data, the (*a*) UNODC reported rates come from multiple sources with differing definitions and (*b*) studies of the structural covariates of cross-national homicide that use homicide rates that depend on these imputation techniques likely use some of the same variables on both sides of the equation.

World Bank World Development Indicators

The WB provides homicide data for several nations from 1990 to 2018. The metadata indicate, however, that their data source is the UNODC International Homicide Statistics database (World Bank 2021a,c). Thus, the WB homicide data duplicate the UNODC data in definition, sources, rates, and limitations. Still, there is not always a perfect match between the two sources. **Supplemental Figure 1** provides year-to-year differences in the homicide rates reported by WB and UNODC. On average, the rates are similar to two decimal places, although the Republic of Moldova and Venezuela exhibit greater differences. Finally, because the WB utilizes the same data as the UNODC, the same limitations that apply to UNODC can be applied to WB.

Supplemental Material >

Research Questions

There is substantially increasing attention in recent years to global and regional homicide trends and the structural covariates of cross-national homicide rates. Furthermore, our description of these four centralized homicide data sources reveals limitations with and differences between each. Thus, like Bennett & Lynch (1990), we must understand if a difference makes a difference, i.e., whether the homicide estimates provided by these different data sources produce different research outcomes. Owing to the methodological limitations of these sources, and to the differences between them, we test for differences by homicide data source in (*a*) homicide trends, (*b*) homicide levels, (*c*) associations with cross-national homicide rates of several typical structural covariates, and (*d*) magnitude and direction of these associations. Meaningful differences in any of these would be troubling because it would mean that some of the findings in the scientific record on cross-national homicide rates could be attributed to the homicide data source researchers selected.

METHODS

Sample

Table 2 provides the nations in the sample by the different years under study. The number of nations for which data are available varies significantly over time. We utilized cross-sectional and pooled cross-sectional designs, both of which are employed regularly within cross-national homicide research. We averaged the data in 5-year periods (1990–1995, 1996–2000, 2001–2005, 2006–2010, 2011–2015, 2016–2018) starting with 1990 and ending with 2018. Note that the first group actually has six years and the last group has three years. Because homicide is a rare event, cross-sectional studies often average data on the dependent variable over multiple years to prevent extreme values in any given year from unduly influencing the results. There is no standard for how

Table 2 Sample of nations for each analysis

Country	1990–1995	1996–2000	2001–2005	2006–2010	2011–2015	2016–2018	1990–1999	2000–2009	2010–2018	Pooled
Albania		X	X	X			X	X	X	
Argentina			X	X	X	X		X	X	X
Armenia	X	X	X	X	X	X	X	X	X	X
Australia	X	X	X	X	X		X	X	X	X
Austria	X	X	X	X	X	X	X	X	X	X
Azerbaijan	X	X	X				X	X		
Bahamas			X					X		
Barbados				X					X	
Belarus	X	X	X	X	X	X	X	X	X	X
Belgium	X	X	X	X	X	X	X	X	X	X
Belize		X								
Bolivia			X					X		
Bosnia and Herzegovina					X				X	
Brazil	X	X	X	X	X	X	X	X	X	X
Bulgaria	X	X	X	X	X	X	X	X	X	X
Canada	X	X	X	X	X		X	X	X	X
Cape Verde					X				X	
Chile			X	X	X	X		X	X	
Colombia	X	X	X	X	X	X	X	X	X	X
Costa Rica	X	X	X	X	X	X	X	X	X	X
Croatia	X	X	X	X	X	X	X	X	X	X
Cyprus			X	X	X	X		X	X	
Denmark	X	X	X	X	X	X	X	X	X	X
Dominican Republic	X	X	X	X	X		X	X	X	X
Ecuador	X	X	X	X	X	X	X	X	X	X
Egypt			X	X	X			X	X	
El Salvador	X	X	X	X	X		X	X	X	X
Estonia	X	X	X	X	X	X	X	X	X	X
Fiji			X	X	X			X	X	
Finland	X	X	X	X	X	X	X	X	X	X
France	X	X	X	X	X	X	X	X	X	X
Georgia		X	X	X	X	X		X	X	
Germany	X	X	X	X	X	X	X	X	X	X
Greece	X	X	X	X	X	X	X	X	X	X
Guatemala		X	X	X	X		X	X	X	
Guyana	X	X		X			X	X		
Haiti								X		
Honduras	X			X	X		X	X	X	
Hong Kong SAR	X	X	X	X			X	X	X	
Hungary	X	X	X	X	X	X	X	X	X	X
Iceland			X	X	X			X	X	
Iran					X				X	
Iraq				X	X			X	X	

(Continued)

Table 2 (*Continued*)

Country	1990–1995	1996–2000	2001–2005	2006–2010	2011–2015	2016–2018	1990–1999	2000–2009	2010–2018	Pooled
Ireland	X	X	X	X	X		X	X	X	X
Israel	X	X	X	X	X	X	X	X	X	X
Italy	X	X	X	X	X	X	X	X	X	X
Jamaica	X	X	X				X	X		
Japan	X	X	X	X	X		X	X	X	X
Jordan				X				X	X	
Kazakhstan	X	X	X	X	X	X	X	X	X	
Kiribati								X		
Kyrgyzstan	X	X	X	X	X	X	X	X	X	X
Latvia	X	X	X	X	X	X	X	X	X	X
Lebanon									X	
Lithuania	X	X	X	X	X	X	X	X	X	X
Luxembourg	X	X	X	X	X	X	X	X	X	X
Malaysia		X	X	X	X		X	X	X	
Maldives			X	X				X	X	
Malta		X	X	X	X	X		X	X	
Mauritius	X	X	X	X	X	X	X	X	X	
Mexico	X	X	X	X	X	X	X	X	X	
Mongolia						X			X	
Montenegro			X	X				X		
Morocco		X		X	X			X	X	
Netherlands	X	X	X	X	X	X	X	X	X	X
New Zealand	X	X	X	X	X		X	X	X	X
Nicaragua	X	X	X	X	X		X	X	X	
Norway	X	X	X	X	X	X	X	X	X	X
Occupied Palestinian Territories				X				X	X	
Panama		X	X	X	X	X	X	X	X	X
Paraguay		X	X	X	X	X		X	X	X
Peru					X	X			X	
Philippines		X	X	X	X		X	X	X	
Poland	X	X	X	X	X	X	X	X	X	X
Portugal	X	X	X	X	X	X	X	X	X	X
Qatar				X	X			X	X	
Republic of Korea	X	X	X	X	X		X	X	X	X
Republic of Moldova	X	X	X	X	X	X	X	X	X	X
Romania	X	X	X	X	X	X	X	X	X	X
Russian Federation	X	X	X	X	X	X	X	X	X	X
Saint Lucia									X	
Serbia			X	X	X	X		X	X	
Seychelles					X			X	X	
Singapore	X	X	X	X	X		X	X	X	X
Slovakia	X	X	X	X	X		X	X	X	X

(*Continued*)

Table 2 (*Continued*)

Country	1990–1995	1996–2000	2001–2005	2006–2010	2011–2015	2016–2018	1990–1999	2000–2009	2010–2018	Pooled
Slovenia	X	X	X	X	X	X	X	X	X	X
South Africa		X	X	X	X		X	X	X	
Spain	X	X	X	X	X	X	X	X	X	X
Sri Lanka		X	X	X	X		X	X	X	
Sweden	X	X	X	X	X	X	X	X	X	X
Switzerland	X	X	X	X	X	X	X	X	X	X
Syrian Arab Republic			X	X				X		
Tajikistan	X	X	X				X	X	X	
Thailand	X	X	X	X	X	X	X	X	X	X
Tunisia				X	X			X	X	
Turkey				X	X	X		X	X	
Ukraine	X	X	X	X	X	X	X	X	X	X
United Arab Emirates									X	
United Kingdom	X	X	X	X	X	X	X	X	X	X
United States	X	X	X	X	X	X	X	X	X	X
Uruguay	X	X	X	X	X	X	X	X	X	X
Uzbekistan		X	X					X		
Venezuela	X	X	X	X	X		X	X	X	X
Zimbabwe	X						X			
Total nation sample size	61	72	81	85	81	53	68	93	92	53

Abbreviation: SAR, special administrative region.

many years to include when smoothing data in this manner, so we settled on the 5-year ranges. For the pooled cross-sectional design, we employed data from 1990 to 2018 and 2000 to 2018. Because GHO did not report data until 2000, we wanted to have a sample in the pooled analyses that took this into account. Data from 2019 are not yet available for many nations, so we excluded them from our analyses. Finally, for each year grouping, we included in the sample only nations with data available on all dependent and independent variables within the year ranges, ensuring the only factor that differs across the models was the source of the outcome variable.

Data

There were four dependent variables. The first is national homicide victimization rates from WHO Mort. WHO defines homicide as the killing of a person by another with the intent to cause death or serious injury by any means (International Classification of Diseases 10th revision categories X85–Y09). The second is national homicide rates from the UNODC. Although homicide definition varies greatly across nations in the UNODC sample, the suggested definition provided to each nation is "unlawful death purposefully inflicted on a person by another person" (UNODC 2018, p. 1). The third is national homicide rates from the World Health Organization's Global Health Observatory (GHO). The GHO homicide definition varies based on the multiple sources from which it draws data. The GHO includes WHO mortality data (ICD 10th revision categories X85–Y09), GHO imputed homicide data, and UNODC adjusted homicide data (WHO 2014). The fourth is national homicide rates from the World Bank, which utilizes the UNODC homicide data (World Bank 2021a).

Our independent variables included six common structural covariates tested in cross-national homicide research (Nivette 2011, Rogers & Alsleben 2021, Santos et al. 2018). The first variable was the Gini coefficient of income inequality, which we obtained from the United Nations WIDER database (United Nations 2022). The second variable was poverty, using the typical proxy of infant mortality (Pridemore 2008, 2011). We obtained the number of infant deaths per 1,000 live births from the World Health Organization (2021a). There were a few nations with missing values, and for these we obtained data from the World Bank (2021c). The third variable was the sex ratio, that is, the number of males per 100 females, which we obtained from World Bank (2021c) population data. The fourth variable was education, for which we used the education component of the Human Development Index and that we obtained from the United Nations Human Development Report (United Nations 2021b). The education index combines the expected number of years of schooling of children at school-entry age and the mean number of years of schooling in the adult population. The fifth variable was the percent of the entire population that lives in an urban area within each nation, which we obtained from the World Bank (2021c). The sixth and final variable was the unemployment rate, which we obtained from the World Bank (2021c). Gross domestic product is also very commonly used in these studies, but we omitted it because of its strong correlation with several other variables in the model.

Analyses

We began with exploratory data analysis. We estimated Pearson correlation coefficients and paired t-tests with unequal variance for homicide rates from all possible combinations of the data sources and year ranges to determine their level of similarity. To present our results we modified the pairs plot within R to include both the Pearson's correlation coefficient and the paired t-test with unequal variance.[2] We then used seemingly unrelated regression (SUR) models, which allowed us to estimate simultaneously the effects of the predictors on WHO, UNODC, GHO, and WB homicide rates. The first set of SUR models utilized the 5-year average data.[3] The second set of SUR models used the pooled cross-sectional data.[4] We included year (time) and nation (panel) fixed effects via dummy variables for year and nation. We then employed a Wald test to check whether there were significant differences in the magnitude of the coefficients from the SUR models across the four homicide data sources. For example, when testing whether the coefficient for poverty is the same using WHO Mort relative to WB data, the Wald test compares the size of the difference between the two coefficients and then determines whether that difference is significantly different from zero. In our case, if the difference is significant it means the selection of homicide data source is influencing the outcome because that is the sole difference in the model estimation process.

[2]The first author wrote the modified pairs plot code. It is available to download, along with all our syntax, log, and data files (see **https://sites.google.com/site/homicidedata/the-impact-of-measurement-on-cross-national-homicide-research?authuser=1#h.omfe23r2e9ag**). We also completed 10-year average analyses, the results for which are available at the above link and in the **Supplemental Materials**.

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[3]The diagnostics for the cross-sectional models included Breusch-Pagan and Cook-Weisberg tests for heteroskedasticity, variance inflation factors, DFBETAs, DFFIT, Cook's distance, the covariance ratio, and the diagonal elements of the hat matrix.

[4]The diagnostics for the pooled cross-sectional models included Fisher type test for unit roots utilizing Dickey-Fuller to check for stationarity, the Hausman Test to ensure fixed effects are preferred over random effects, the Wooldridge test for autocorrelation in panel data to check for autocorrelation, the Pearson test of cross-section independence, the Modified Wald test for groupwise heteroskedasticity, variance inflation factors, DFBETAs, DFFIT, Cook's distance, the covariance ratio, and the diagonal elements of the hat matrix.

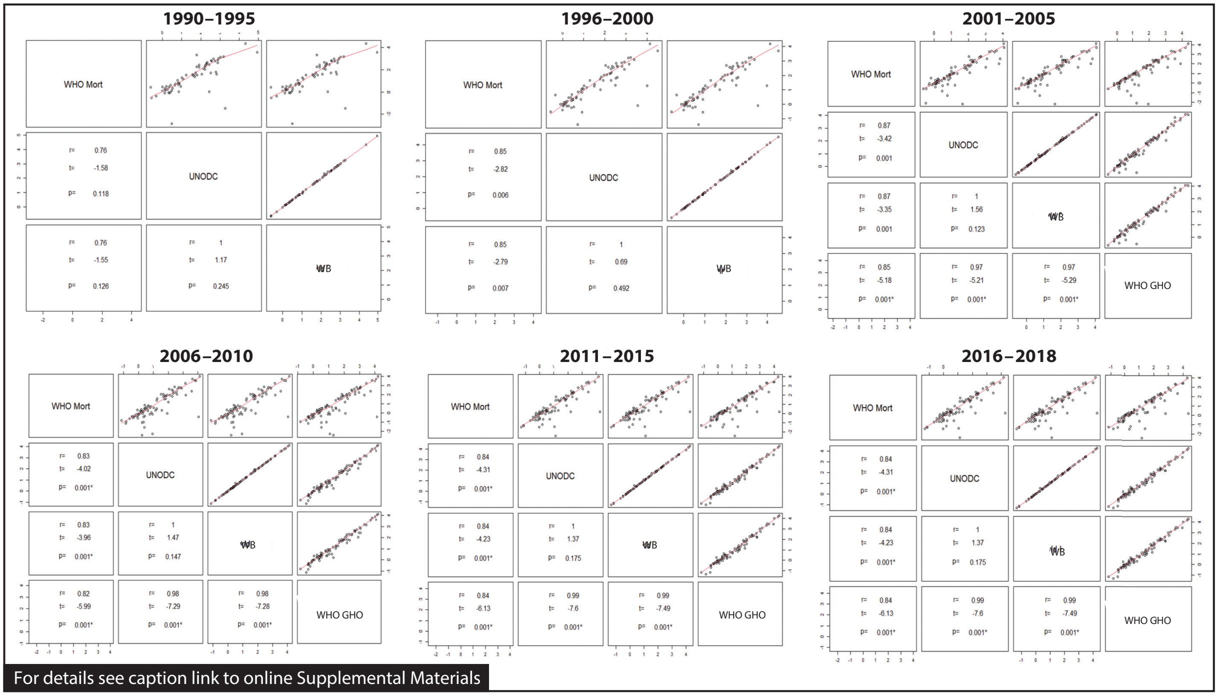

Figure 2

Modified pairs plot for 5-year average homicide rates. The x-axis is the column variable and the y-axis is the row variable. For example, in the 1990–1995 graph, the y-axis is WHO Mort homicide rates and the x-axis is the UNODC homicide rates. In the graph to the immediate right of the 1990–1995 graph, the y-axis is WHO Mort homicide rates and the x-axis is WB homicide rates. *$p < 0.001$. For a detailed view of this figure, see **Supplemental Materials**. Abbreviations: p, p-value for paired t-test with unequal variance; r, Pearson's correlation coefficient; t, paired t-test with unequal variance t-statistics; UNODC, United Nations Office on Drugs and Crime; WB, World Bank World Development Indicators database; WHO GHO, World Health Organization Global Health Observatory; WHO Mort, World Health Organization Mortality Database.

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Using the results from our analyses, we estimated predicted within-sample homicide rates based on the best-fit line equations. The independent variable of interest within each graph (see **Supplemental Figures 4 and 5**) is allowed to vary from its minimum to its maximum values in the sample, with all other variables held at their mean. We then graphed the best-fit line based on the predicted homicide rates and the observed values of the independent variables. We are not trying to predict homicide rates but simply providing a graphical representation of the slope for each of the variables (and year frames) when holding other covariates at their mean. In the graphs, we include the slope and p-value by homicide data source. Owing to the large number of estimations and the follow-up analyses, we present the results as a series of graphs instead of presenting them in table format.

Exploratory data analysis results for the 5-year average homicide rates. **Figure 2** presents modified scatter plots for the 5-year average homicide rates from the four data sources. The modified scatter plot can be interpreted much like a correlation matrix. The upper right shows the graphical bivariate relationship between the column variable (y-axis) and row variable (x-axis), with a locally weighted scatter plot smoothing (LOWESS) line in red. The bottom left provides the Pearson correlation coefficient (r), the t-statistic from a paired sample t-test with unequal variance, and the p-value for the t-statistic.

Owing to the shared data between UNODC and WB, their correlations with WHO homicide rates are the same within each of the 5-year averaged time frames. Correlations ranged from 0.76 (1990–1995) to 0.87 (2001–2005). GHO data are available from 2000 to 2018. Although the World Health Organization is responsible for homicide rates from both the Mortality Database and the GHO, due to GHO's adjustments and imputation procedures the WHO Mort and GHO rates are not the same. Correlations between WHO Mort and GHO homicide rates ranged from 0.82 (2006–2010) to 0.85 (2000–2005). Despite the generally high correlations, the differences in the average homicide rate between WHO Mort and each of the other sources were statistically significant within the other 5-year periods, except for 1990–1995.

Recall that the WB borrows directly from the UNODC data. Thus, the UNODC average homicide rates were not significantly different from the WB data in any of the 5-year time spans. The UNODC and WB average homicide rates were perfectly correlated (r = 1.00) in each 5-year period. There were a few instances (e.g., 2001–2005) where a single or a few nations did not have the same homicide rates between the UNODC and WB, although the reasons for this are unclear because according to the World Bank metadata the UNODC is supposed to be its sole source of homicide data.

Average GHO homicide rates were nearly perfectly correlated with the UNODC and WB rates. The correlations ranged from 0.97 (2001–2005) to 0.99 (2011–2015, 2016–2018). This is not surprising because GHO uses UNODC as one of its sources of homicide data (and vice versa, according to the UNODC metadata). Despite this correlation, the difference in the average homicide rates for GHO compared to UNODC and WB are significant. Therefore, although GHO, UNODC, and WB homicide rates trend together, the variation in the reported rates is enough to result in statistically significant differences in the average homicide rate for the former relative to the latter two.

Overall, WHO Mort homicide data have the largest reported differences from the others in the 5-year periods. Given that WB utilizes UNODC homicide data, and the GHO and UNODC each use the other's data to help correct for missingness in their own data, it is not surprising that the WHO Mort data stand apart, both in how they trend and in the overall average rates within the 5-year periods.

Pooled models exploratory data analysis. These data are pooled over time and thus not independent, therefore both the correlations and the paired sample tests should be interpreted with caution. **Figure 3** provides the modified scatter plots for the pooled data (across nations, during the periods 1990–2018 and 2000–2018). Across both pooled periods WHO Mort homicide rates were nearly perfectly correlated (r = 0.96) with UNODC and WB rates, WHO Mort rates and GHO rates were nearly perfectly correlated (r = 0.97), UNODC and WB rates were perfectly correlated (r = 1.00), and GHO rates were nearly perfectly correlated with UNODC and WB rates (r = 0.98).

Seemingly unrelated regression and Wald test results for the 5-year average homicide rates. **Figure 4** provides graphs of the SUR results for 5-year groupings. Full results are available in tabular format in **Supplemental Material Table 1**. If the differences in homicide rates observed in the exploratory data analysis were due to systematic overcounting or undercounting of homicide across the different data sources, we would expect the slopes to run parallel to each other. Therefore, the best-fit lines based on the within-sample prediction of homicide rates would be parallel for each source. Looking at each variable in each 5-year range, this is rarely the case.

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The Wald test determines whether the differences in the coefficients for each variable across the SUR models are 0. For example, if we subtract the coefficient for the Gini coefficient in the

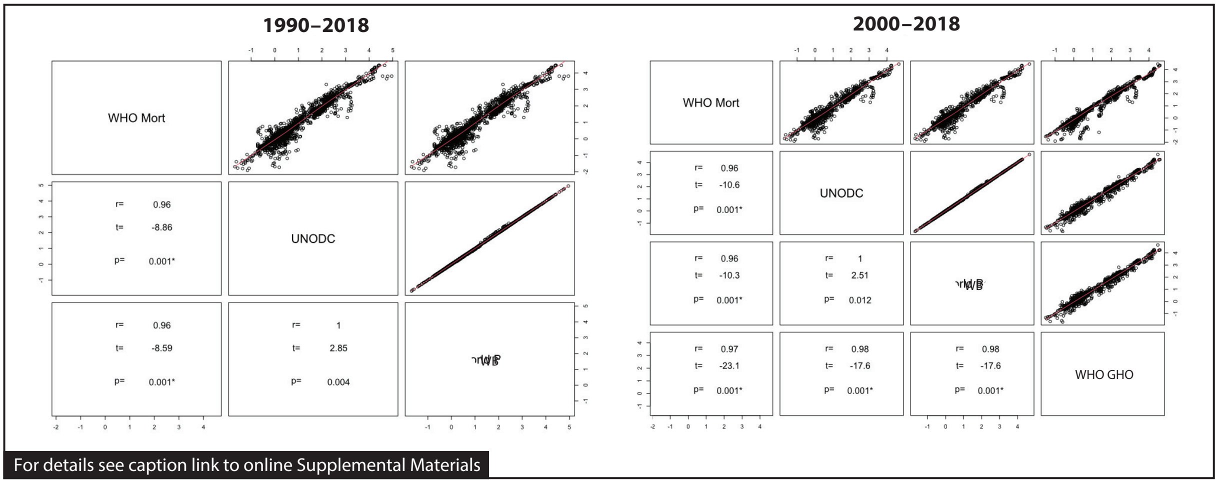

Figure 3

Modified pairs plot for pooled (1990–2018, 2000–2018) average homicide rates. The x-axis is the column variable and the y-axis is the row variable. For example, in the 1990–2018 graph, the y-axis is WHO Mort homicide rates and the x-axis is the UNODC homicide rates. In the graph to the immediate right of the 1990–2018 graph, the y-axis is WHO Mort homicide rates and the x-axis is WB homicide rates. *$p < 0.001$. For a detailed view of this figure, see **Supplemental Materials**. Abbreviations: p, p-value for paired t-test with unequal variance; r, Pearson's correlation coefficient; t, paired t-test with unequal variance t-statistics; UNODC, United Nations Office on Drugs and Crime; WB, World Bank World Development Indicators database; WHO GHO, World Health Organization Global Health Observatory; WHO Mort, World Health Organization Mortality Database.

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WHO model from that in the UNODC model, is the result significantly different from 0? Therefore, this is a pair-wise comparison for all possible combinations of the independent variables by homicide data source (WHO Mort versus UNODC, WHO Mort versus WB, WHO Mort versus GHO, UNODC versus WB, UNODC versus GHO, and WB versus GHO). **Figure 5** provides a graphical representation of the Wald Test for all possible comparisons. These results are available in tabular format in **Supplemental Material Table 2**.

Figure 4 and **Figure 5** can help us determine two types of differences. First, we can discover if there is a significant association between an independent variable and homicide for one data source, but that association is nonsignificant for one or more of the other homicide data sources. It is also possible that a variable may have a significant positive association with homicide rates from one source and a significant negative association with homicide rates from another source. This is not due to something like multicollinearity, because the predictor variables are the same across all SUR models and so the only difference across the models is the source of homicide rates. The second type of difference this approach allows us to detect is in the magnitude of the association. The slope describing the association with homicide rates for an independent variable may be more pronounced for one source relative to another. The figures may still indicate some differences in slopes even if the variable is not significantly associated with homicide rates, meaning the overall slope is not significantly different from 0 and thus there is no true difference between the coefficients. In **Figure 5**, we provide the critical value (point at which $p < 0.05$) and the Bonferroni corrected critical value to adjust for the multiple Wald Tests conducted.

Results show that four of our six independent variables had different outcomes by data source in some of the time periods. For poverty, the differences were in the 2000–2005 and 2006–2010 periods. In 2000–2005, poverty was significantly associated with homicide rates when using WHO Mort data but not when using other sources. In 2006–2010, the opposite was true, poverty was

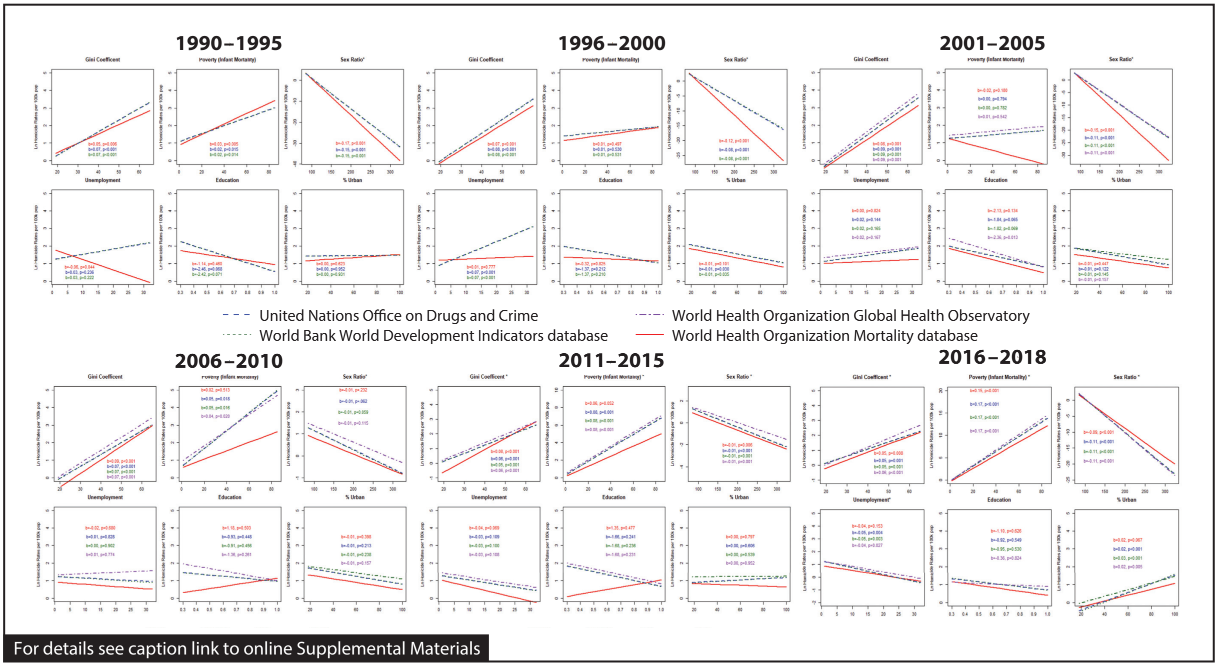

Figure 4

Predicted homicide rates within sample by data source for 5-year periods. World Health Organization Global Health Observatory does not have data for 1990–1999. All other variables are held at their mean. *y-axis is unlike other plots in graph. For a detailed view of this figure, see **Supplemental Materials**.

not significantly associated with homicide when using WHO Mort data, but it was significantly associated with homicide when using UNODC, WB, or GHO data. For the sex ratio, there were differences by data source during the 2006–2010 period. Sex ratio was not significantly associated with homicide using WHO Mort and GHO data but was significantly associated with homicide when using UNODC and WB data. For unemployment, there were differences in the results by data source in three 5-year periods. In 1990–1995, unemployment was significantly associated with homicide when using WHO Mort data but not when using UNODC and WB data. In 1996–2000 and 2016–2018, unemployment was not significantly associated with homicide when using WHO Mort data, but it was significantly associated with homicide when using all other data sources. Finally, in 1990–1995 and 2000–2005, the education index was not significantly associated with homicide rates when using WHO Mort data, but it was significantly associated with homicide for all other data sources.

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The other possible difference is in the magnitude of the association. That is, is there a significant difference in the size of the slope coefficient for a variable in one data source relative to its size when using another data source? The Gini coefficient (2016–2018), sex ratio (2000–2005, 2011–2015), and percent of the population living in an urban area (2011–2015, 2016–2018) all showed differences by data source in the magnitude of their associations with homicide rates.[5]

[5]The 10-year average seemingly unrelated regression and Wald tests are available in **Supplemental Material Tables 3 and 4**.

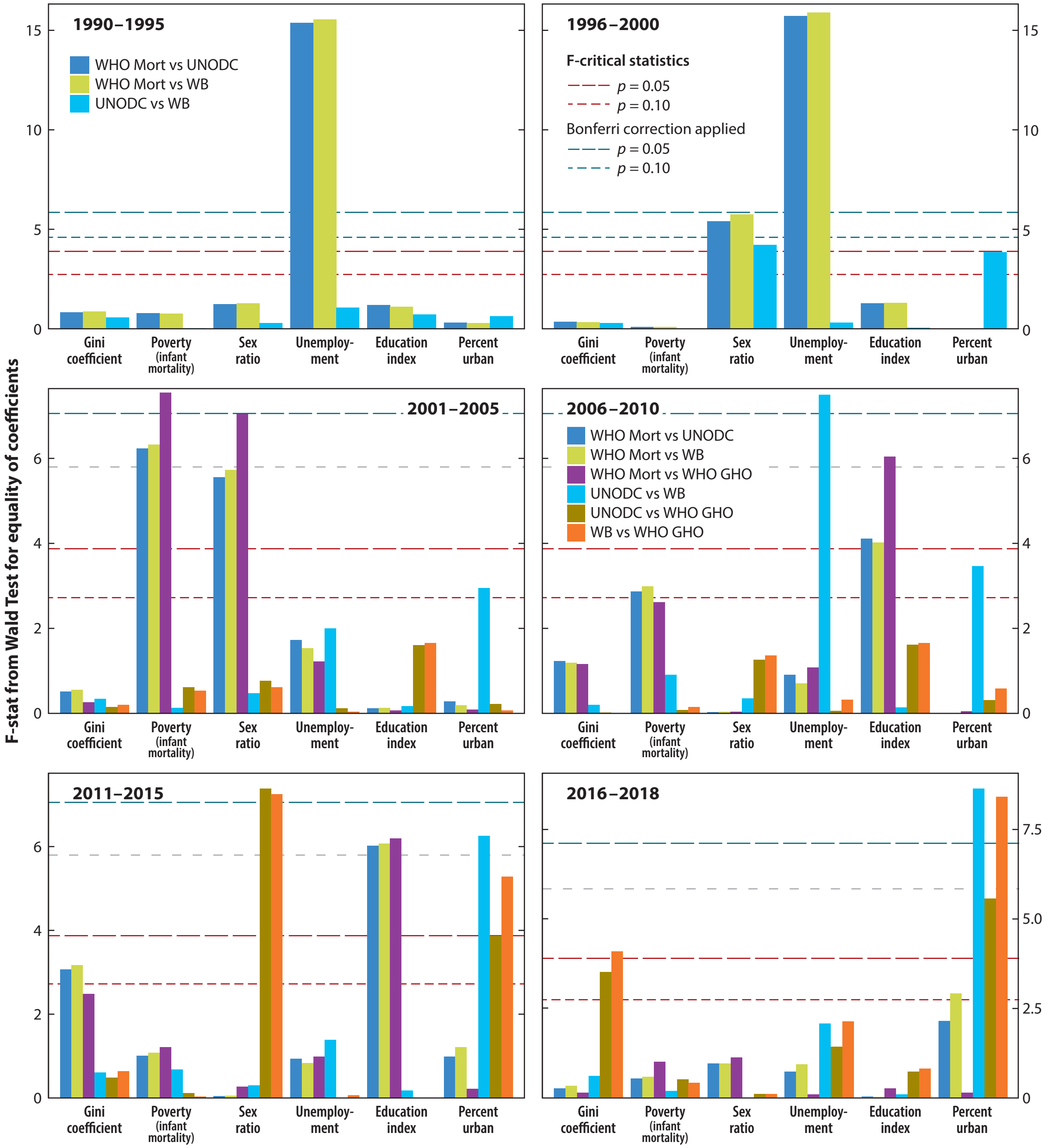

Figure 5

Five-year average Wald Test results. Abbreviations: UNODC, United Nations Office on Drugs and Crime; WB, World Bank World Development Indicators database; WHO GHO, World Health Organization Global Health Observatory; WHO Mort, World Health Organization Mortality Database.

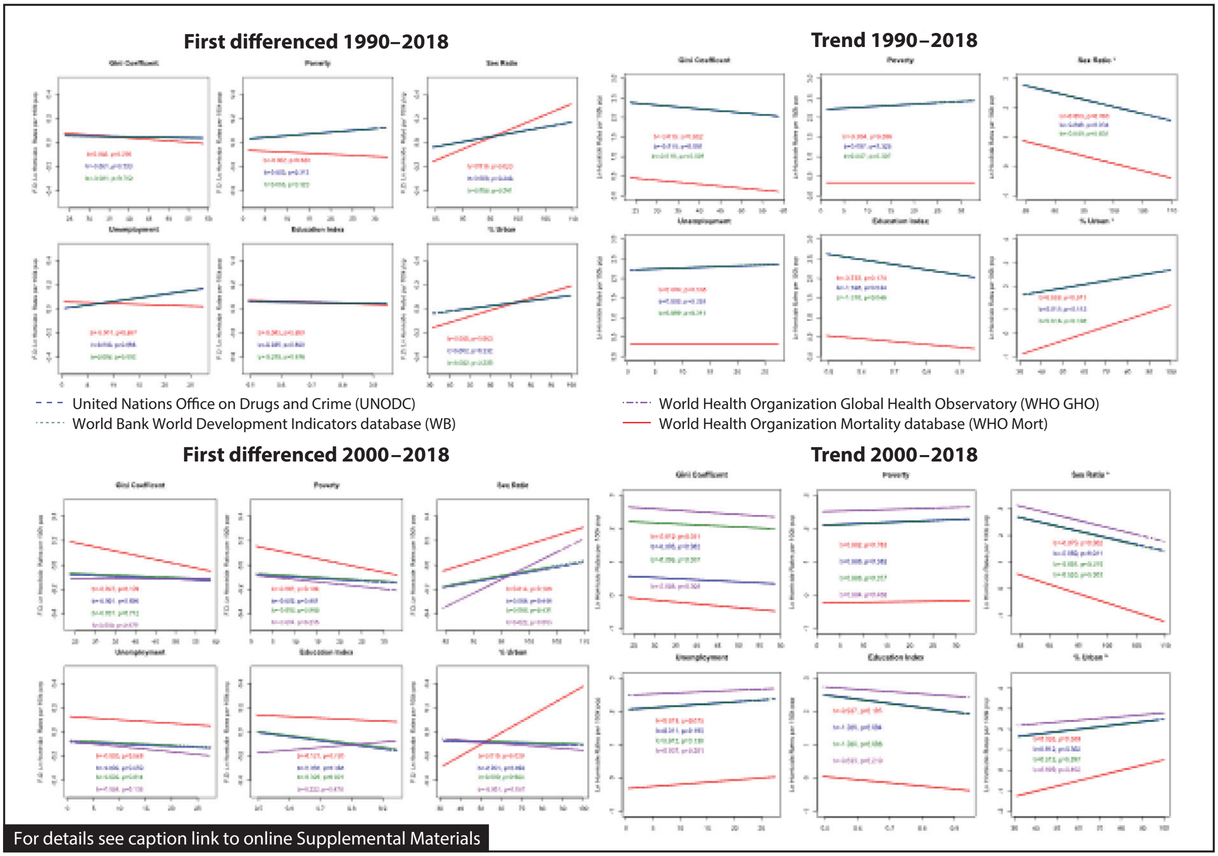

Figure 6

Predicted homicide rates within sample by data source for pooled models (first differenced, trend). WHO GHO does not have data for 1990–1999. All other variables are held at their mean. *y-axis is unlike other plots in graph. For a detailed view of this figure, see **Supplemental Materials**. Abbreviations: UNODC, United Nations Office on Drugs and Crime; WB, World Bank World Development Indicators database; WHO GHO, World Health Organization Global Health Observatory; WHO Mort, World Health Organization Mortality Database.

Pooled cross-sectional seemingly unrelated regression and Wald tests. **Figure 6** provides the best-fit line representation of the models, along with the slope coefficient and p-value. Results are shown in tabular format in **Supplemental Material Table 5**. The figure provides evidence of differences in the overall conclusions and the direction of association between many of the variables depending on the homicide data source. The most troubling variable is the percentage of the population that lives in an urban area. Across all model specifications (first differenced 1990–2018 and 2000–2018, trend 1990–2018 and 2000–2018), percent urban was significantly associated with homicide rates when using WHO Mort data. In all other models using data from the other sources, however, there was no association (the only exception was in the trend model for 1990–2018, but that was only with a one-tailed test). There were also differences by data source in the association with homicide rates for (*a*) sex ratio and unemployment for the 1990–2018 first differenced model; (*b*) education index and percent urban for the trend 1990–2018 model; (*c*) Gini coefficient, poverty, and percent urban for the first differenced model for 2000–2018;

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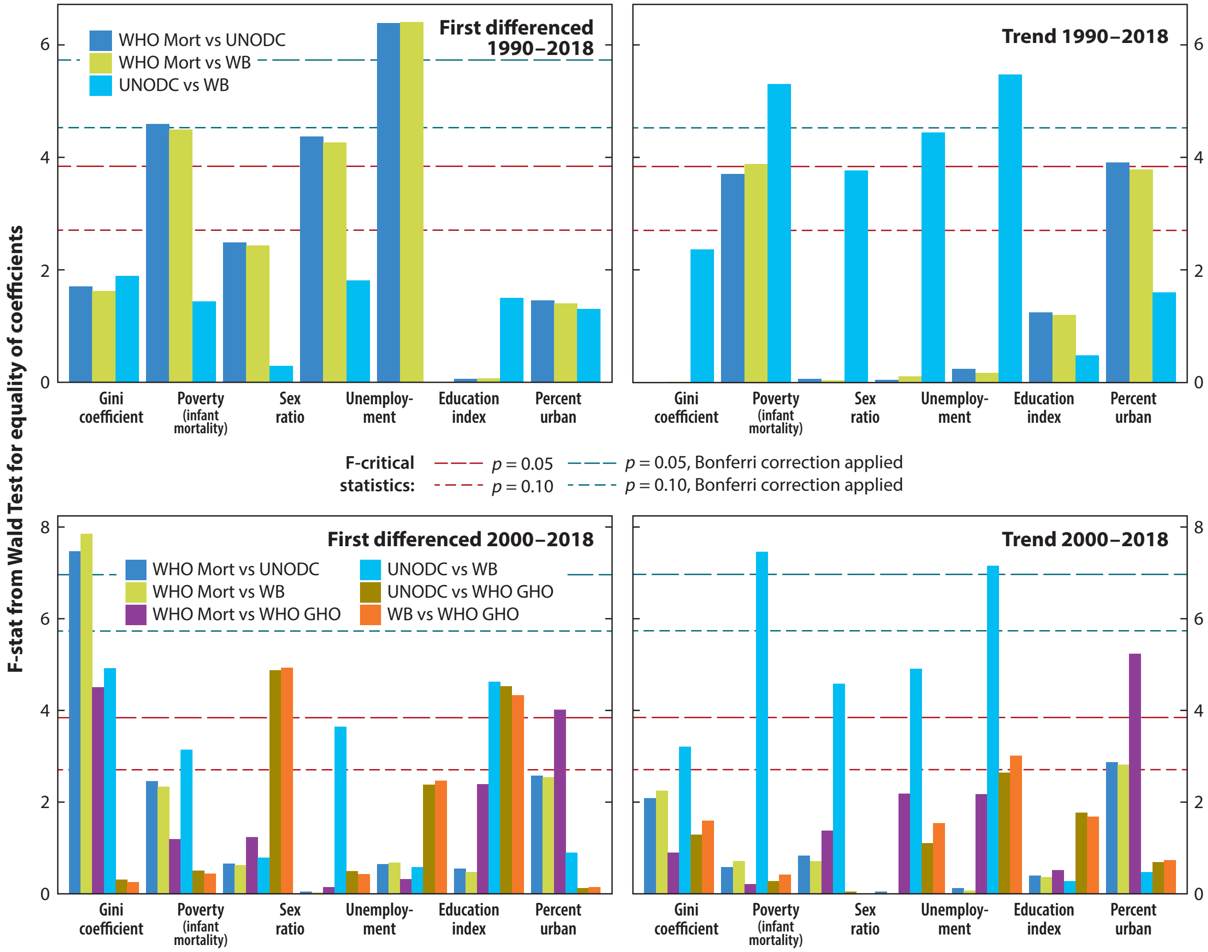

Figure 7

Pooled average Wald Test results. Abbreviations: UNODC, United Nations Office on Drugs and Crime; WB, World Bank World Development Indicators database; WHO GHO, World Health Organization Global Health Observatory; WHO Mort, World Health Organization Mortality Database.

and (*d*) Gini coefficient, unemployment, education, and percent urban for the 2000–2018 trend model. In short, results were heavily dependent on homicide data source for nearly every variable and time period combination.

Supplemental Material >

Figure 7 presents the Wald test results in a simple bar graph. Results are shown in tabular format in **Supplemental Material Table 6**. Once again, most of our independent variables exhibited significantly different coefficients by data source. In addition to being problematic in itself, this is also important because such variation would contribute to differences in the effect sizes calculated in meta-analyses. The figure shows unemployment (first difference model, 1990–2018) and education (trend model, 1990–2018) were the most troubling, with directional changes in the coefficients by data source. These SUR differences are reflected in the Wald test. The coefficients for poverty crossed the threshold for a significant difference in coefficients with a Bonferroni correction in all models except the first difference 2000–2018 model (in this model, poverty only crossed the threshold for a significant difference in coefficients when no correction was applied).

DISCUSSION

The wide variation in national homicide rates throughout the world tells us something elemental about the impact on violence of a nation's history, culture, social structure, and location in the world system. Temporal variation in global, regional, and national homicide rates over long periods also likely tells us something fundamental about how changes in social organization and social relations as nations develop and experience demographic transition influence not only violence rates but the nature of crime itself, especially the characteristics of crime victims, offenders, and events (Pridemore 2021). These potential insights are reflected in the surging popularity of cross-national homicide research. Beginning in 2016, it took less than 5 years to reach the same number of cross-national homicide studies published in peer-reviewed journals than had been published in 27+ years beginning in 1974. This increased attention in substance has not been accompanied by a similar increase in attention to method. Limitations in measurement and method pose a range of threats to this important research area. We show that measurement of the dependent variable around which this research revolves is one of those central threats.

We asked the same question Bennett & Lynch (1990) asked more than 30 years ago: Does a difference make a difference? That is, do we draw the same conclusions about the patterns and structural covariates of cross-national homicide rates when using each of the four centralized sources of national homicide data? These sources are the World Health Organization's Mortality Database, WHO's Global Health Observatory, United Nations Office on Drugs and Crime, and World Bank's World Development Indicators. We conducted a series of exploratory and inferential analyses, which we believe is the most thorough to date, to address this methodological question. Unfortunately, we did not come to the same conclusion as Bennett & Lynch. Our results revealed that a difference does make a difference. We found that trends, rates, significance of relationships between typical structural covariates and homicide rates, and magnitude and even direction of those relationships are often dependent upon homicide data source.

Statistical analyses are only as good as the measures we utilize to operationalize our concepts. It is troubling for the scientific record on cross-national homicide rates that there are consistent differences in a range of outcomes due to the homicide data source. We found differences based not only on data source but also on how we averaged the dependent variable (i.e., over 5- or 10-year time frames provided in **Supplemental Material Figures 2 and 4** and **Tables 3–4**) and on analysis type (i.e., cross-sectional models relative to pooled cross-sectional models). It is common in this literature to see different results across studies for the same independent variable. These differences are likely driven mainly by methodological limitations of individual studies and by methodological differences between studies. Our results suggest that one key source of these methodologically based differences is the choice of which source to use for national homicide rates. The extent of this problem in this literature is modulated by the extent to which studies utilize different homicide data sources.

Supplemental Material >

Differences in Trends and Levels

It is cold comfort that homicide rates from three of the four data sources are extremely highly correlated with each other. These high correlations are not indicative of agreement between independent surveillance systems each with its own method of data collection but of interrelated systems that draw from similar sources and, most troubling, from each other. The uncomfortable observations are further complicated because although the homicide rates across sources strongly covary (which we see from the correlations), the overall average homicide rates (i.e., for the same sample across sources) are significantly different (which we see from the paired t-tests). This is true even within sources that obtain data from another source (WB utilizing the UNODC data).

There is no clear explanation as to why the WB sample has significantly different overall average homicide rates than the UNODC when the UNODC is supposed to be the only source from which the World Bank obtains data. What looks like a slight deviation in **Figure 1** is greater when comparing within nation (as seen in **Supplemental Material Figure 1**). There are some nations that have vastly different homicide rates reported in the World Bank compared to the UNODC.

Supplemental Material >

Differences in Significance of Associations

When testing theory, scholars typically draw conclusions about relationships between the independent and dependent variables based on statistical significance. We observed consistent differences in the (non)significance of relationships with homicide rates for the typical structural covariates employed in this literature over all time frames. The only variables that maintained the same level of association with homicide rates across each data source and period were income inequality (always significantly and positively associated with homicide rates) and percent of the population that lives in an urban area (consistent nonsignificant associations with homicide rates, with the one exception of 2016–2018). Associations of the unemployment rate and the education index with homicide rates exhibited the greatest discrepancies in significance.

Of all our findings, the differences in the significance of association between each independent variable and homicide across the sources are probably the most concerning outcome for the scientific record on cross-national homicide rates. Scholars in this area often assume that data source does not seriously influence any associations they do or do not find between their independent variables and national homicide rates. That is, all else being equal, their conclusions are not dependent on homicide data source. The evidence presented here reveals that a difference does make a difference and shows that differences by homicide data source are common and that they occur throughout the 1990–2018 era, during each of the time period types (5-year, 10-year, and pooled over entire period), and for each estimation technique (cross-sectional, pooled cross-sectional). Because we constrained our models and samples to be exactly the same except for the source of the outcome variable, these observed differences cannot be attributed to methodological threats typical to this area of research (e.g., multicollinearity, partialling), and must be attributed to the homicide data source.

What Is to Be Done?

Evidence points to the WHO Mortality Database as the most reliable source of national homicide rates when modeling temporal and geographic variation. This is based on our results here and on the prior analyses and conclusions of others, and we recommend it in spite of the smaller number of nations for which WHO provides homicide rates. Other data sources provide homicide rates for a larger and more heterogeneous sample of nations, but the evidence suggests this comes at a serious and—depending on the type of analyses being undertaken—potentially fatal cost.

Although this answer appears straightforward after discovering the different outcomes by data source and over time, the path to resolving this question is still complex. For example, a statistically driven answer to this question would begin with finding which source of homicide rates provides the best-model-fit statistics when employing the typical structural covariates. A central limitation of this approach, however, lies in the source of within-nation-year homicide data for UNODC, WB, and GHO. The homicide rate estimates from these sources are not independent. The original within-nation data sources from which each of these systems draw are often similar or the same, and each system also commonly uses data from the other systems. For a given nation-year homicide rate, it is often difficult or impossible to untangle the original within-nation source, and system source, of the homicide rates relying solely on the information the systems provide publicly. For example, UNODC earlier provided detailed information about whether they were using WHO Mort or GHO data to correct for missing data in the UN-CTS, and this was differentiated in the raw data download. This information has since been simply labeled as "World Health Organization," however, and it now appears impossible to trace whether the WHO Mort or WHO GHO rates are used. Furthermore, in its metadata, WB states that they obtain their data from UNODC. This is obvious for most nation-years because the rates are identical. In a handful of nation-years, however, the homicide rates are different, with no apparent explanation for the discrepancy. If forced to speculate, we would guess that in these cases UNODC updated their homicide rates after initial publication but WB did not log that update.

By not knowing exactly where the data originated for UNODC and WB, we cannot parse out when the UNODC (and thus WB) utilized homicide data from GHO or the WHO Mort. This is important specifically in this situation and more generally due to the imputation techniques used by the GHO. This is because the usual statistics we would employ in model selection [e.g., adjusted R^2, residual sum of squares (RSS), and predicted residual error sum of squares (PRESS)] are likely biased because GHO uses typical structural covariates of cross-national homicide rates in its imputation techniques. Thus, the same variables are present on both sides of the equation. The RSS measures how well the model explains variation in the outcome variable. The lower the score (i.e., the smaller the residuals), the better the model is at accounting for variation in the dependent variable, in our case homicide rates. PRESS shows the difference between the observed homicide rates relative to the predicted homicide rates for each nation based on the best-fit line equation. The smaller the PRESS, the better the within-sample prediction based on the best-fit line. But in the situation of structural covariates of cross-national homicide rates using GHO, UNODC, and WB data, these statistics are not helpful because GHO (and thus UNODC because it often uses GHO data, and thus WB because it nearly always uses UNODC data) employs typical variables like infant mortality, percent urban, and the Gini coefficient to impute nation-year homicide rates that are missing or untrustworthy. Out of curiosity, we calculated RSS, PRESS, R^2, and adjusted R^2s for all our cross-sectional models. PRESS and RSS statistics were the smallest, and the adjusted R^2s were some of the highest, across all the models in which GHO was the homicide data source. These exploratory results provide initial evidence that the fears of using this data source are justified for precisely the reasons suggested. In short, it is difficult to trust tests of association between many independent variables and homicide rates, and difficult to trust model fit statistics, when employing homicide rates from GHO, UNODC, and WB.

Rand & Rennison (2005) reminded us that "bigger is not necessarily better." Although the UNODC, WB, and GHO provide homicide rates for a larger and more heterogeneous sample of nations, this comes at a damning cost, the loss of data integrity. UNODC cannot guarantee that reporting nations universally employ its definition of homicide. GHO includes many typical predictors when imputing homicide rates. And in one form or another, UNODC, WB, and GHO all use each other's data. The WHO Mortality Database employs a uniform definition, traces the source to medically certified deaths, and does not impute or otherwise adjust homicide rates. Employing homicide rates from the WHO Mortality Database necessarily means an underestimate of the true homicide count and results in a smaller and more homogeneous sample size. The underestimation of homicide rates is very typically smaller with vital statistics data, however, relative to the police data often used by the other three sources. Thus, if researchers wish to employ in their models of cross-national homicide rates independent variables that GHO uses to impute homicide data (which is almost always the case even if only as control variables), or even structural covariates that are likely highly correlated with these typical variables, then the WHO Mortality Database is the best source of homicide rates.

CONCLUSION

A difference makes a difference in cross-national homicide research. At least within parametric model estimation for associations between typical structural covariates and homicide rates, (non)significance and magnitude of coefficients are dependent on homicide data source. Thus, when choosing the homicide data source for cross-national analyses we must fully understand how each source generates its homicide rates, the limitations of each, and that maximizing sample size purely because data exist does not mean those data are valid for the purposes of such studies. We must also be transparent that choosing a different source might result in different conclusions. At this moment, we believe the WHO Mortality Database provides the highest fidelity homicide rate estimates for cross-national studies, but this could change over time and it may be worth the extra effort for scholars to employ multiple sources of homicide data and compare results for consistency. In modern research, a few additional models are not terribly time-consuming. The additional effort will benefit (*a*) each individual study by ensuring the results are stable and the conclusions drawn are reasonable, (*b*) readers assessing the findings of these studies, and (*c*) the scientific record on the temporal and geographic variation of cross-national homicide rates. The substantial temporal and geographic variation in cross-national homicide rates indicates fundamental differences in social structure, social organization, history, and culture, so the greater trust we have in the validity of the homicide rates the better we will be at understanding and explaining the sources of this variation.

Finally, that a difference makes a difference in our estimation of parametric models does not discount the recent and ongoing surge of cross-national homicide research in criminology and allied fields like sociology, economics, political science, and area studies. Cross-national homicide and its structural covariates deserve greater research attention in an ever-changing and increasingly globalizing world. Although homicide rates are often sensitive to local issues, they also appear to respond to population-level structural covariates, and national violence rates can be associated in complex ways with changes occurring elsewhere in the world system. Cross-national homicide research can discover regional and global trends and capture these population- and global-level causes and consequences of national homicide rates. More generally, supporting research growth on the topic will result in a more nuanced understanding of this phenomenon. New and better data to test theories of temporal and geographic variation in national homicide rates, which earlier cross-national homicide scholars might only have dreamed of, are becoming increasingly available. Furthermore, as LaFree (2021) and Messner (2021) recently lamented, we have made only limited advances in developing new theory from the knowledge generated via cross-national and comparative research, so perhaps the increase in information will allow us to create and test new theories of this variation. Methodological limitations face all areas of research, so although the limitations evidenced in this article are serious, they do not detract from the importance of cross-national homicide research and the insights it can provide.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

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