The Effect of Counting Rules on Cross-National Comparisons of Homicide

David Buil-Gil[1] **Jose Pina-Sánchez**[2] **Marcelo F. Aebi**[3]

[1]The University of Manchester, [2]University of Leeds, [3]Université de Lausanne

Published on: Mar 07, 2025

DOI: https://doi.org/10.21428/cb6ab371.aba1ae7a

ABSTRACT

Purpose: Cross-national crime comparisons often rely on police statistics. Most commonly, such comparisons focus on homicide, as it is expected to be the crime type least likely to go undetected. This study examines how different statistical counting rules and legal definitions employed across European countries affect the reliability of cross-national homicide comparisons. **Methods:** Data on homicide from 41 European countries (1998–2022) were accessed from Eurostat and compared with three independent sources of vital statistics recorded by the World Health Organization and the Institute for Health Metrics and Evaluation. Correspondence rates between police-recorded homicides and vital records were assessed descriptively and graphically to identify cross-national and temporal variations. Additionally, within-between models were estimated to assess the impact of statistical counting rules and legal definitions on cross-national homicide comparisons. **Results:** Statistical counting rules and legal definitions for homicide vary widely across countries, influencing the likelihood of homicides being recorded in police statistics and affecting cross-national comparability. Countries that record data when crimes are first reported to the police tend to present higher homicide records than those using process-based or output-based systems. Furthermore, broader definitions of homicide (e.g., those including terrorism-related deaths) are associated with higher recorded homicide. **Conclusions:** National counting rules and legal definitions substantially impact the reliability of cross-national homicide comparisons based on police data. This challenge is likely even greater in regions with less standardized counting rules and legal frameworks or for crime types more susceptible to under-recording, posing a significant challenge for comparative criminological research.

1. Introduction

The study of cross-national crime comparisons is as old as the first criminal justice statistics (de Candolle 1987[1830], 1987[1832]; Quetelet 1831) and remains one of the fastest-growing areas in criminology and criminal justice research (Eisner 2023; Tonry 2015; van Dijk et al. 2022). Researchers increasingly utilize open-source data to assess cross-national crime trends, explore associations between crime and a growing range of predictors such as population composition and economic conditions, and develop theories of crime to explain observed international differences (Bennett 2004; LaFree 2021). However, these types of cross-national comparative studies have faced considerable criticism for overlooking crime reporting propensities, crime recording practices, and other policy factors influencing the likelihood of crimes being reported and recorded (Aebi 2010; Bennett and Lynch 1990; von Hofer 2000).

Comparative criminologists have sought to minimize the limitations of official crime records by focusing on the most severe crime type, homicide. The focus of comparative criminology on homicide relies on the assumption that homicides are more likely to be recorded in crime statistics than other types of crime, therefore allowing for reliable cross-national crime comparisons. As Gary LaFree (2021: 59) argues, the emphasis on homicide in international criminology “reflects the defensible assumption that […] homicides are more likely

to be reported to police, police are more likely to record homicides […], and legal systems can be expected to spend more time and resources collecting information on homicides."

While it is difficult to dispute that homicides are more likely to be recorded by the police than other offenses, cross-national crime comparisons based on police records of homicides still rely on three additional assumptions that are commonly overlooked. These assume that the following factors remain constant across countries and over time: (i) the probability of homicide *detection*, (ii) the *statistical* rules and legal *definitions* used to count homicides, and (iii) the *recording* procedures (Killias and Rau 2000). Evidence suggests that these assumptions are not met in practice (Aebi et al. 2024; Eurostat 2024).

A complex interplay of factors influences how crimes are recorded across countries. These factors can be categorized into four main types (Aebi 2010; von Hofer 2000). First, *statistical factors* pertain to the counting rules that determine whether and how known incidents are included in official records. For instance, while some countries register a crime the moment it is reported to the police—known as *input-based systems*—others document it only at later stages, such as during the investigation (*process-based systems* or *intermediate systems*) or upon its conclusion (*output-based systems*). As a result, two countries with identical crime rates may report different figures simply due to variations in when incidents are logged, with input-based systems recording higher numbers (Aebi 2008). Second, *legal factors* pertain to differences in the laws governing criminal justice, including variations in legal procedures and offense definitions. For instance, some countries adopt narrow definitions of homicide, not counting terrorism-related deaths as homicides, while others include them; similarly, assisted euthanasia may or may not be legally defined as homicide, further complicating cross-national comparisons (Chon and Clifford 2021; Harrendorf 2012, 2018). Third, some *substantive factors* shape recorded crime rates independently of actual crime levels. For instance, differences in the public's willingness to report crimes to law enforcement significantly influence crime statistics (Estienne and Morabito 2016), as does the likelihood of those reported crimes being formally recorded by the police (Boivin and Cordeau 2011). Finally, *criminal policy factors* (or simply *policy factors*) also play a critical role in shaping crime statistics. Shifts in law enforcement priorities, such as intensified crackdowns on drug-related offenses or increased attention to gender-based violence, can lead to fluctuations in recorded crime rates even if actual crime levels remain unchanged (Aebi 2010).

International efforts to document cross-national differences in crime statistics began in the 1990s with the work of the expert group responsible for the *European Sourcebook of Crime and Criminal Justice Statistics* (CoE 1999). The methodology developed by this group for collecting *metadata*—data about data, specifically on how criminal statistics are compiled and reported across countries—relies on a structured set of questions addressing these factors, which are distributed to national correspondents in each country. This approach was later adopted in the 2000s by the United Nations Office on Drugs and Crime (UNODC) and by Eurostat for its Crime Statistics (Eurostat 2024). Since then, these metadata collection efforts have systematically documented variations in counting rules and recording practices across countries, with the aim of enhancing the

comparability of international crime statistics. However, they are not always taken into account when conducting such comparisons.

In this study, we examine the association between *statistical* counting rules and *legal* definitions and the recording of homicides in criminal justice records across 41 European countries over a period of 25 years (1998-2022). The core research question we aim to address is: "How do statistical counting rules and legal definitions affect cross-national crime comparisons based on police statistics?" We use homicide as a case study due to its aforementioned high recording rates compared to other crime types.

Specifically, we explore the reliability of homicide data reported by Eurostat, which compiles police statistics from European Union (EU) member states. To do so, we compare Eurostat records against three sources of vital statistics provided by the World Health Organization (WHO) and the Institute for Health Metrics and Evaluation (IHME). We use these sources of vital statistics to assess cross-national variation in the *recording* of homicides in police data. As part of our analysis, we assess the geographic and temporal variability in the differences observed across measures of homicide, and analyze the influence that documented counting rules have on those disparities. We conclude by providing recommendations for researchers and policymakers on how to enhance interpretations of cross-national crime comparisons.

2. Measuring Homicide Across Countries

The use of police-recorded homicide statistics is widespread in policymaking and research. Politicians, policymakers and the media worldwide rely on trends in homicides recorded by criminal justice agencies as a primary indicator of crime trends over time and as a measure of the effectiveness of crime prevention and justice initiatives. Internationally, the 'Global Study on Homicide', published by the United Nations Office on Drugs and Crime (UNODC 2023) primarily relies on official data reported by national criminal justice agencies. From 1954 to 2006, Interpol released annual reports containing homicide figures reported by police agencies across approximately 100 countries. Additionally, the *European Institute for Crime Prevention and Control* (HEUNI), affiliated with the United Nations, and the *European Sourcebook of Crime and Criminal Justice Statistics* (henceforth, European Sourcebook), which is partially linked to the Council of Europe, compile and disseminate police-recorded homicide data across European countries. Within the EU, Eurostat is responsible for compiling, documenting, and disseminating official crime records across member countries, including metadata on statistical and legal counting rules.

2.1 Variations in Counting Rules and Definitions

Despite efforts to standardize crime definitions and counting rules, such as the 2015 *International Classification of Crime for Statistical Purposes* (ICCS) developed by UNODC (Bisogno et al. 2015), substantial inconsistencies persist. Assessments by Eurostat (2024) and the European Sourcebook (Aebi et al. 2021, 2024) document considerable variation in how countries apply statistical rules and legal definitions when counting crimes, including homicides.

For instance, regarding the statistical counting rules, among the 41 countries included in Eurostat, twenty-two of them (54%) record an incident when it is first reported to the police (*input*), twelve countries (29%) document it during the investigation process, and seven (17%) only after the police investigation is completed (*output*). Similarly, only nine countries (22%) apply the *principal offense rule*, which records only the most serious crime in cases involving multiple offenses (e.g., robbery followed by homicide). For *serial offenses* occurring in a single incident, thirty-one countries (76%) record all incidents, while five record only one, and five follow mixed systems. For crimes with *multiple offenders*, all countries except Kosovo record a single offense, with Kosovo counting a separate incident for each perpetrator. These statistical counting rules can significantly affect the reliability of recorded crime (Aebi 2008, 2010; von Hofer 2000). However, the principal offense rule is less likely to impact homicide records given homicide's position as the most serious offense. Similarly, variations in counting rules for serial offenses are likely to have limited impact on cross-national homicide comparisons due to the low incidence of serial homicides in Europe (Sturup 2018). Variations in rules for crimes with multiple offenders are largely inconsequential in Europe, as only one country follows a different standard.

In addition to statistical counting rules, legal definitions used to classify behaviors within crime types vary significantly across countries (Albrecht 1989; Chon and Clifford 2021). The ICCS mandates including several categories as homicide: honor killing, serious assault leading to death, terrorism-related deaths, dowry-related killings, femicide, infanticide, voluntary manslaughter, extrajudicial killings, and deaths caused by excessive use of force by state officials. However, compliance with these requirements is inconsistent. Among the 38 countries with documented legal definitions, only seven (18%) include all required categories. Countries such as Poland and Slovakia exclude up to five of these categories, while only seventeen of 36 countries (47%) with relevant documentation classify extrajudicial killings as homicide.

The ICCS also specifies eight categories that should be excluded from homicide statistics: attempted intentional homicide, non-intentional homicide, non-negligent or involuntary manslaughter, assisted or instigated suicide, illegal feticide, euthanasia, deaths due to legal interventions, and justifiable homicide in self-defense. Only eleven of 37 countries with relevant documentation (30%) exclude all these categories from their homicide records. Belgium excludes only two, while Lithuania, Netherlands, and Sweden fail to separate four categories from their homicide records. Notably, euthanasia is classified as homicide in seventeen of the 41 countries (42%) for which data are available. Switzerland is the only European country that fully complies with all ICCS homicide inclusions and exclusions.

2.2 Alternative Data Sources

Given these limitations in police-recorded statistics, alternative data sources have gained popularity for cross-national homicide comparisons. While victimization surveys provide valid measurements for common crimes like property offenses (van Kesteren et al. 2014) and non-lethal violence (Heise and Kotsadam 2015), they cannot, by design, capture homicide data.

In the absence of a *gold standard*, vital records based on death certificates completed by medical professionals serve as an important alternative to police statistics (Koeppel et al. 2013; Nivette 2011).[1] The WHO Mortality Database, which provides raw counts of homicides recorded by health authorities, is widely regarded as the most reliable source of vital homicide records for cross-national research (Rogers and Pridemore 2023).

Vital records, however, also have limitations. Coverage issues exist as many countries report vital statistics sporadically if at all. Moreover, the WHO cannot ensure global compliance with standardized homicide definitions (Smit et al. 2012). Perhaps most significantly, the WHO Mortality Database consistently shows the lowest homicide counts among all international databases (see Figure 1), suggesting potential under-recording in most countries (Andersson and Kazemian 2018; Herre and Spooner 2023; Rogers and Pridemore 2023; Santos and Testa 2024).

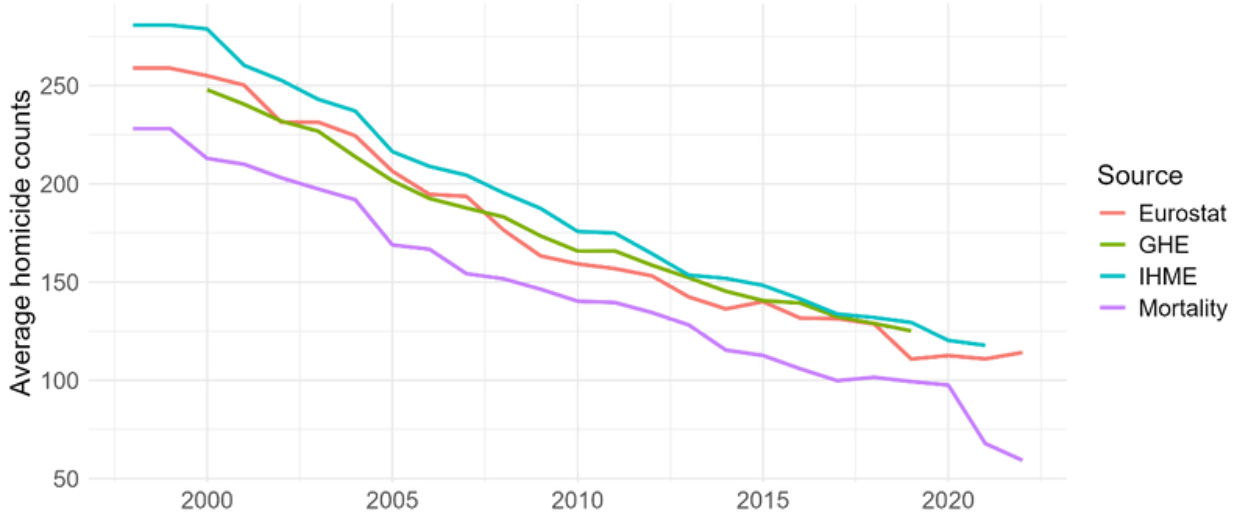

Figure 1 *Trends on average homicide records according to Eurostat, WHO Mortality, WHO Global Health Estimates (GHE), and Institute for Health Metrics and Evaluation (IHME) across 40 European countries (excluding Turkey and Serbia 1998-1999)*

2.3 Adjusted Homicide Estimates

To address methodological issues in both criminal justice data and raw vital records, international organizations apply various adjustments (Marshall and Block 2004). The WHO publishes adjusted homicide estimates through its *Global Health Estimates* (GHE), which combine corrected vital records adjusted for underreporting and misclassification, adjusted criminal justice data, and predicted estimates. The GHE prioritizes vital records when differences between health and criminal justice records are not substantial, resorting to predicted estimates only when reliable data are unavailable from vital and police sources (Kanis et al. 2017; WHO 2014: 62–66).[2]

Kanis et al. (2017) note that GHE are problematic for analyzing predictors of homicide across countries because some predictors of homicide typically analyzed in research are included in the models producing these estimates. The WHO (2014: 62) recommends using these estimates primarily for "understanding the likely homicide burden within a country." Hence, comparing them to Eurostat records may serve as a proxy for homicide under-recording in police data. Notably, recording rules are not considered in the regression models used to adjust homicide estimates by WHO or other agencies.

The Institute for Health Metrics and Evaluation (IHME) also produces adjusted national homicide estimates in its annual Global Burden of Disease (GBD) reports. These estimates are used by the WHO, other international organizations, and researchers worldwide (Kanis et al. 2017).[3] Like GHE, IHME estimates combine corrected vital records, adjusted criminal justice data, and modeled estimates, prioritizing vital health records. However, IHME's modeling procedures differ from GHE's, incorporating epidemiological data and surveillance systems for certain countries. IHME does not share its raw input data, only the final estimates. As Mathers (2020: 9) explains, while transparency regarding analytical decisions has improved, "*full replication even of specific results is in practice not possible,*" and available documentation does not fully explain discrepancies between IHME and WHO estimates (e.g., Alkema and You 2012). Table 1 presents details of each vital statistics source.

Table 1 *Summary of vital register datasets (adapted from Rogers and Pridemore 2023: 450)*

	Global Health Estimates (GHE)	**Mortality**	**Institute for Health Metrics and Evaluation (IHME)**
Definition of homicide	Killing of a person by another with intent to cause death or serious injury.	Killing of a person by another with intent to cause death or serious injury.	Deaths due to intentional use of physical force, conflict and terrorism, or police conflict and executions.
Inclusions and exclusions	Inclusions: infanticide. Exclusions: reckless or negligent behavior.	Inclusions: infanticide. Exclusions: reckless or negligent behavior.	Inclusions: interpersonal violence, conflict and terrorism, police conflict and executions.
Data collection	Vital registration, complemented with police and UNODC records.	Vital registration.	Vital registration, complemented with police, UNODC and WHO records, NGO reports, and academic sources.
Adjusted or imputed	Yes	No	Yes

URL	https://www.who.int/data/gho/data/indicators/indicator-details/GHO/ghe-estimates-of-number-of-homicides	https://platform.who.int/mortality/themes/theme-details/topics/indicator-groups/indicator-group-details/MDB/violence	https://ghdx.healthdata.org/

2.4 Implications for Research

Different sources of international homicide data lead to varying estimates across countries and time (Andersson and Kazemian 2018; Rogers and Pridemore 2023; Santos and Testa 2024) and different conclusions regarding key predictors of cross-national homicide variation. Nivette's (2011) review of 54 studies examining cross-national homicide found that only studies using police-recorded data (from Interpol, HEUNI, and the European Sourcebook) estimated a significant positive association between female labor and homicide, while population sex ratio showed significant association only when using WHO data.

Without a gold standard for homicide counts, understanding cross-national and temporal variations in crime recording remains challenging. Metadata from Eurostat (2024) and the European Sourcebook (Aebi et al. 2021) detail national differences in counting rules. Our study examines how these rules affect homicide recording across 41 European countries over 25 years, comparing Eurostat police data with homicide vital statistics from WHO Mortality, GHE, and IHME to enhance the robustness of our findings (Dawson 2018; Frantz 2019).

3. Data and Methods

3.1 Data

3.1.1 Eurostat Homicide Data

Each year, Eurostat requests national statistical institutes and criminal justice agencies of EU member states to share crime data through a standardized questionnaire. This includes police-recorded offenses at national and regional levels as well as in some large cities, aggregated data on suspects' characteristics (age, sex, legal status, citizenship), victim-offender relationship, and relevant judiciary and prison records. These data are stored across various portals on the EU's official website.[4]

Eurostat defines homicide as "unlawful death purposefully inflicted on a person by another person," with specific inclusions and exclusions as detailed in the previous section. The database encompasses information from 41 countries, though availability varies by country and time period. For example, data from the UK (England and Wales, Northern Ireland, and Scotland) are only available until 2018 due to Brexit; Albania, Bosnia and Herzegovina, and Kosovo have only contributed data since 2008; and Turkey has no data available

between 2008 and 2017. Participating countries are requested to comply with ICCS standards, and Eurostat maintains detailed metadata documenting each country's compliance with these standards (Eurostat 2024).

This metadata provides comprehensive information on various measurement aspects across countries. Eurostat documents whether countries record crime data at input, process, or output stages, whether they apply the principal offense rule, how they count serial offenses of the same type, and their approach to counting offenses committed by multiple suspects. Additionally, the metadata captures information about inclusions and exclusions of specific behaviors in national homicide records as mandated by the ICCS (see Figure 2). While this information is available for most countries, it is not complete for all. Countries lacking full information were excluded from our analytical sample. For England and Wales, Scotland, and Northern Ireland, we supplemented Eurostat's (2024) metadata with comparable measurement information from the European Sourcebook (Aebi et al. 2021).

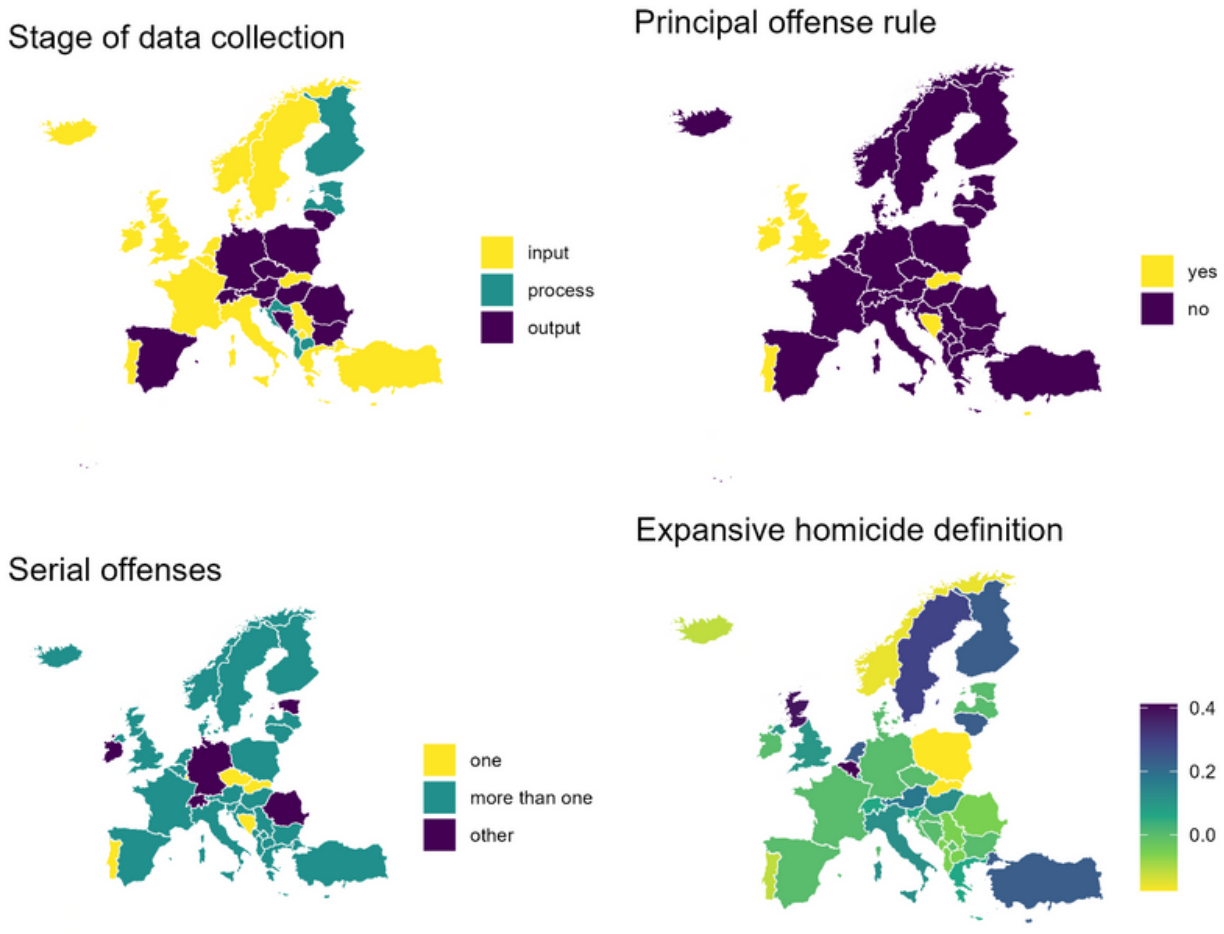

Figure 2 *National counting rules used to record homicides across Eurostat countries*

3.1.2 Vital Statistics Data

To assess the reliability of police-recorded homicide data, we compare Eurostat statistics against three sources of vital statistics: WHO Global Health Estimates (GHE), WHO Mortality Database, and the Institute for Health Metrics and Evaluation (IHME). We utilize these vital statistics in two distinct ways. First, we calculate correspondence rates between police and vital records for each country and year, documenting the relationship between police and vital homicide records across time and space. The correspondence rate, CR_{it}, for Eurostat statistics in a given country *i* and year *t*, is calculated as the ratio between the number of Eurostat-recorded homicides, denoted as $Eurostat_{it}$, and the number of homicides recorded in each vital statistics source, denoted respectively as GHE_{it}, $Mortality_{it}$ and $IHME_{it}$.

Hence, $CR_{it}^{GHE} = \frac{Eurostat_{it}}{GHE_{it}}$, $CR_{it}^{Mortality} = \frac{Eurostat_{it}}{Mortality_{it}}$, and $CR_{it}^{IHME} = \frac{Eurostat_{it}}{IHME_{it}}$.

A measure of 1 indicates perfect correspondence (i.e., equal number of records in Eurostat and vital statistics), while a score between 0 and 1 reflects under-recording in Eurostat data, and values above 1 indicate over-recording in Eurostat data. Second, we also use vital records as control variables in our models exploring the association of counting rules and police-recorded homicide, ensuring that variations in police counting rules are not confounded with differences in overall homicide levels as reported by independent vital statistics sources.

3.2 Analytical Strategy

For the first part of our analysis, we describe and visualize the distribution and cross-country variation of correspondence rates (i.e., ratio between police-recorded homicide and vital statistics) using descriptive statistics, histograms, and scatter plots. This exploratory analysis allows us to assess the under- or over-recording of homicide in police statistics, as compared to the three available sources of vital records. We also visualize the correspondence rates across countries and over time, examining whether the identified under- or over-recording of homicide, as compared to vital records, varies across countries and years.

For the second part of our analysis, we employ two sets of ‘within-between’ hybrid models implemented in a random-effects framework (Fairbrother 2014; Mundlak 1978) to estimate the association between statistical counting rules and police-recorded homicide. This approach allows us to incorporate time-invariant predictors (i.e., counting rules) while explicitly accounting for within-country and between-country effects of time-varying controls (i.e., vital statistics). The within-between model achieves this by decomposing the time-varying controls into within-country components (time-varying deviations) and between-country components (group means). All measures of homicide used in our models are log-transformed to reduce the right-skewness in homicide counts.

Specifically, we augment the random effects model by incorporating both the time-varying measures of vital records (i.e., log-transformed GHE_{it}, $Mortality_{it}$ and $IHME_{it}$, respectively) and their country-level

group means as control variables. This decomposition enables separate estimation of within-country and between-country effects while isolating the impact of time-invariant predictors, such as counting rules. The observed estimates of counting rules are robust to variations in vital statistics and potential correlations between country-specific effects and the predictors. By pooling information across countries and adjusting for country-specific differences, the within-between model accounts for unobserved heterogeneity and reduces potential omitted variable bias.

The within-between model assumes that the error term has two components, an entity-specific component, u_i, unique to each country, randomly distributed, and constant over time, and an idiosyncratic error term, ϵ_{it}, which varies for each observation. In practice, the within-between model is defined as follows:

$$log(Eurostat_{it}) = \beta_0 + \gamma_1 log(Vital_{it}) + B_1\, log(\overline{Vital_i}) + \beta_2 CountingRule1_i + \beta_3 CountingRule2_i -$$
(Eq. 1)

Here, β_0 is the overall intercept, γ_1 is the coefficient for the within-country effect of the time-varying control variable of vital records, β_1 is the coefficient for the between-country effect of the group mean of vital statistics, and β_2 and β_3 are the coefficients for our time-invariant predictors (counting rules). u_i and ϵ_{it} are the two error terms. We use Generalized Least Squares (GLS) for estimation.

We estimate two sets of within-between models. First, we examine the association between general counting rules (i.e., stage of data collection [input], principal offense rule [yes], rule for serial offenses [multiple]) and an overall measure of expansiveness in homicide definitions (i.e., proportion of possible behaviors included in the homicide measure, centered around its median) and police-recorded homicides. Second, we explore how each of the inclusion or exclusion rules used in the legal definition of homicides are associated with recorded homicides. Both sets of analyses include vital statistics as control variables.

Lastly, we use the conditional association of each counting rule on police-recorded homicides to adjust homicide estimates for the inconsistencies in the use of counting rules across countries. First, we select the set of predictors (counting rules) that show at least to be significantly associated with Eurostat homicide counts in any of our three models while pointing in the same direction across all three models. That is, we select counting rules that appear to have a consistent association with police recording of homicides across countries. Second, we use regression coefficients calculated from our within-between models and determine the average effect size across the three models. We then apply these averaged regression coefficients to derive counting rules-adjusted estimates of police-recorded homicide rates.

All analyses were conducted in R (R Core Team 2024) with the assistance of the ‘plm’ package (Croissant and Millo 2008) to estimate our within-between effect models. The analytic code and input data are available on GitHub (https://anonymous.4open.science/r/counting-homicide/).

4. Results

When compared to GHE and IHME estimates, Eurostat homicide records appear to underestimate homicide in most countries (see Figure 3). The mean correspondence rate is 0.90 for GHE and 0.98 for IHME, with 73% and 63% of countries, respectively, showing underestimation in Eurostat records over time. In contrast, correspondence rates show the opposite pattern when comparing Eurostat records with WHO Mortality data. Here, the mean correspondence rate is 1.31, with 66% of countries showing overestimation in Eurostat records. While GHE and IHME suggest that Eurostat data underestimates homicide, WHO Mortality registers report even fewer offenses than Eurostat in most countries. [5] This discrepancy is evident in both the histograms and scatter plots in Figure 3.

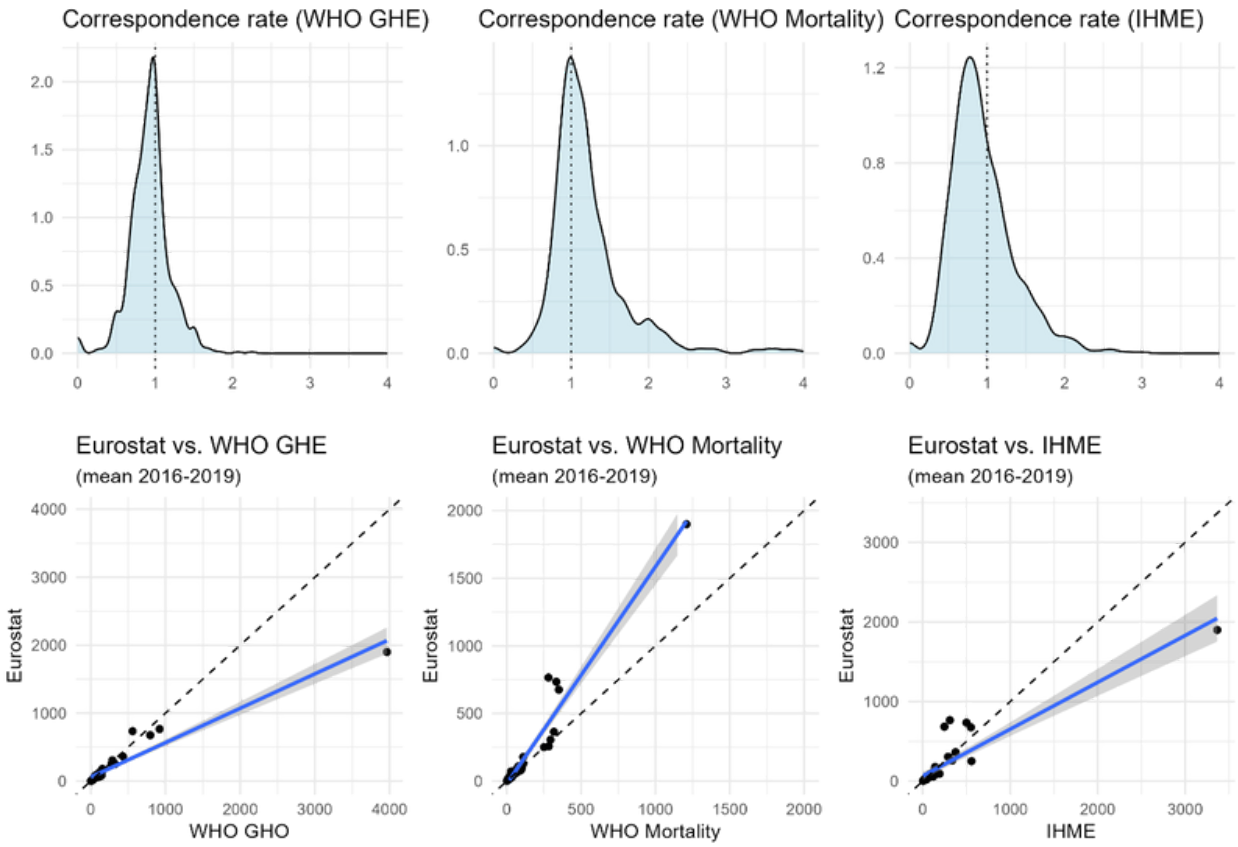

Figure 3 *Comparison of Eurostat and vital records according to GHE, WHO Mortality and IHME. Notice how Eurostat records tend to overestimate homicide counts compared to WHO Mortality, but underestimate it compared to IHME and GHE, although there is a great degree of between-country variability.*

This is further illustrated in Figure 4, which analyzes temporal and geographic variations in correspondence rates. While correspondence rates derived from GHE and IHME exhibit overall temporal stability, correspondence rates with WHO Mortality show a growing divergence, suggesting an increasing under-recording in Mortality data. When examining geographic variations in correspondence rates, also in Figure 4,

clear differences emerge depending on the vital statistics data used for comparison. For example, if we were to rely on GHE data, Turkey and Iceland would appear as the countries were police data underestimates homicides the most. In contrast, Poland, North Macedonia, Albania, and Serbia are highlighted as having the lowest recording rates based on the comparison with IHME, while Cyprus, Norway, and Hungary show the lowest rates according to the comparison with WHO Mortality. At the opposite end of the spectrum, some consistency is observed, with France consistently identified as having a relatively high correspondence rate (ranking in the top five across all three comparisons). Similarly, the United Kingdom is noted for its high rate according to Mortality and IHME, and Malta for its high rate according to GHE and IHME. Overall, however, the ranking of correspondence rates appears to be heavily influenced by the choice of vital statistics measure used in the analysis.

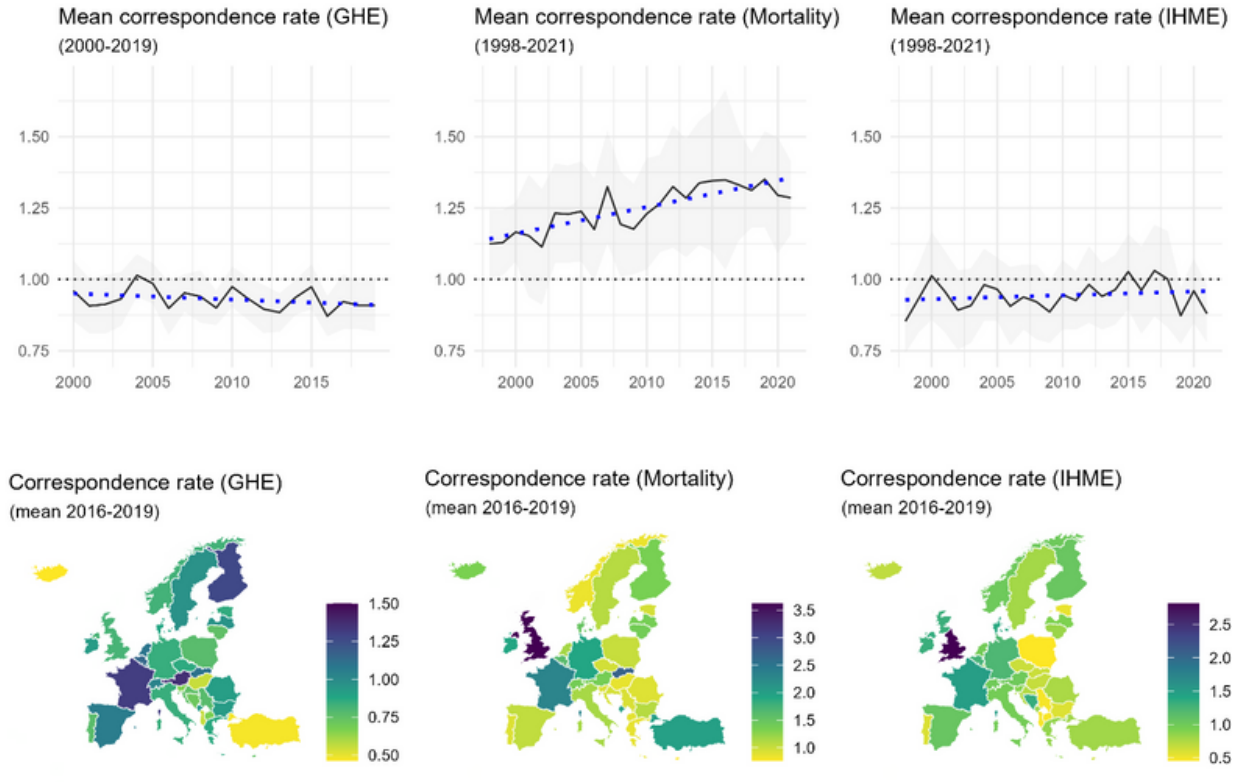

Figure 4 *Temporal and geographic variation in correspondence rates. Top: whereas GHE and IHME correspondence rates appear to be stable over time, Mortality correspondence rates indicate a growing divergence in the last couple of decades. Bottom: country-specific correspondence rates vary considerably depending on the source of vital statistics used for analysis (note the change in scales across the three maps).*

Next, we analyze the association of national counting rules with Eurostat homicide counts, conditional on homicide counts from the three vital statistics sources. The results displayed in Table 2 examine the relationship between general counting rules and homicide counts from Eurostat, while those in Table 3 focus

on its association with different inclusion and exclusion criteria in the legal definition of homicide used by police statistics in each country.

From the first set of analyses, the estimates in all three models indicate that, as could be expected, an expansive definition of homicide, where a broader range of incidents are recorded as homicides, is associated with higher homicide recording. However, this relationship is statistically significant only in the model controlling for IHME vital estimates. The stage of data collection shows a positive association with police-recorded crime across all datasets, although this relationship is only statistically significant in the model controlling for GHE estimates. This association indicates that countries where the police record homicides at the point when the crime is first known to them (*input* stage) show higher homicide figures than those using process- or output-based systems. Neither the application of the principal offense rule nor the counting of serial offenses as multiple events shows a significant association with police-recorded homicide. Lastly, it is worth noting how controlling for vital records, both in their original time-varying form and their country-level mean, helps increase the models' goodness-of-fit as they are statistically significant.

We proceed to analyze the association of each legal inclusion and exclusion criteria on Eurostat homicide records. The inclusion of terrorism in criminal justice records of homicide is associated with higher records, and this association is statistically significant in two of our three models. Second, the inclusions of femicide and assisting or instigating suicide are significantly associated with higher homicide records in the models controlling for GHE statistics. In the case of the model controlling for IHME estimates, this is also true for the inclusion of euthanasia. Importantly, although statistical significance is not always reached across models, we observe that for the above highlighted factors, the direction of their associations, and in many cases their effects sizes, remain remarkably consistent across models.

Table 2 *Within-between models exploring the association of general counting rules with log-transformed police-recorded homicide counts per country.*

	GHE			**Mortality**			**IHME**		
	Estimate	CI	p-value	Estimate	CI	p-value	Estimate	CI	p-value
(Intercept)	**-0.30**	-0.50 – -0.10	0.003	-0.23	-0.56 – 0.10	0.168	**-0.45**	-0.86 – -0.05	0.027
Stage collection (input)	**0.13**	0.03 – 0.23	0.011	0.14	-0.02 – 0.30	0.087	0.12	-0.09 – 0.33	0.251

Principal offense rule	-0.07	-0.22 – 0.08	0.340	0.06	-0.18 – 0.30	0.642	0.15	-0.11 – 0.40	0.267
Serial offenses (more than one)	-0.08	-0.19 – 0.04	0.189	-0.05	-0.24 – 0.13	0.572	-0.10	-0.33 – 0.13	0.397
Expansive definition	0.33	-0.01 – 0.68	0.058	0.26	-0.29 – 0.82	0.348	**0.87**	0.18 – 1.56	0.013
log(vital records)	**0.66**	0.60 – 0.72	<0.001	**0.77**	0.74 – 0.81	<0.001	**0.91**	0.85 – 0.97	<0.001
log(mean vital records)	**0.39**	0.32 – 0.45	<0.001	**0.29**	0.22 – 0.36	<0.001	**0.14**	0.05 – 0.23	0.002
Parameters	σ^2_{within} = 0.07 σ^2_u = 0.01 θ = 0.55			σ^2_{within} = 0.04 σ^2_u = 0.04 θ = 0.79			σ^2_{within} = 0.06 σ^2_u = 0.08 θ = 0.82		
Observations	n = 690 T = 10-20 N = 36			n = 748 T = 1-25 N = 36			n = 885 T = 14-24 N = 39		
R^2 / R^2 Adjusted	0.880 / 0.879			0.832 / 0.831			0.702 / 0.700		

σ^2_{within} represents the residual variance within countries, σ^2_u represents the "random intercept" variance at the country level (i.e., between-group variance), and θ represents the proportion of the total variance attributable to differences between countries. R^2 indicates the proportion of variance explained by the predictors, and R^2 Adjusted is the R^2 adjusted for the number of predictors. N = unique countries; T = time periods (years); n = total observations (countries/years)

Table 3 *Within-between models exploring the association of categories included in legal definitions of homicide with log-transformed police-recorded homicide counts per country.*

	GHE	**Mortality**	**IHME**

	Estimate	CI	p-value	Estimate	CI	p-value	Estimate	CI	p-value
(Intercept)	**-0.81**	-1.21 – -0.41	<0.001	-0.08	-0.90 – 0.73	0.844	**-1.13**	-2.03 – -0.23	0.014
Serious assault leading to death	0.03	-0.10 – 0.15	0.684	0.09	-0.16 – 0.33	0.487	0.11	-0.18 – 0.39	0.462
Terrorism	**0.21**	0.08 – 0.35	0.002	**0.27**	0.00 – 0.54	0.048	0.31	-0.00 – 0.62	0.053
Femicide	**0.34**	0.05 – 0.63	0.021	-0.13	-0.74 – 0.47	0.662	0.38	-0.25 – 1.00	0.235
Infanticide	-0.10	-0.31 – 0.11	0.344	-0.24	-0.65 – 0.17	0.259	-0.16	-0.64 – 0.32	0.518
Voluntary manslaughter	-0.08	-0.20 – 0.04	0.185	-0.04	-0.28 – 0.19	0.718	0.01	-0.26 – 0.29	0.925
Extrajudicial killing	0.07	-0.04 – 0.19	0.199	0.03	-0.20 – 0.26	0.809	0.12	-0.14 – 0.38	0.356
Excessive force law enforcement	-0.04	-0.15 – 0.07	0.496	-0.15	-0.37 – 0.07	0.178	-0.04	-0.30 – 0.21	0.739
Attempted intentional homicide	0.06	-0.09 – 0.20	0.438	0.04	-0.24 – 0.33	0.760	0.06	-0.28 – 0.39	0.746
Non-intentional or justifiable homicide	-0.04	-0.10 – 0.03	0.253	-0.03	-0.15 – 0.09	0.662	-0.07	-0.21 – 0.07	0.316

Assisting/instigating suicide	**0.16**	0.03 – 0.29	0.016	0.08	-0.17 – 0.33	0.545	0.12	-0.17 – 0.41	0.414
Illegal feticide	0.07	-0.07 – 0.21	0.322	0.08	-0.19 – 0.35	0.563	0.12	-0.20 – 0.43	0.460
Euthanasia	-0.02	-0.11 – 0.08	0.754	0.14	-0.05 – 0.33	0.145	**0.22**	0.00 – 0.43	0.047
Death during legal interventions	0.03	-0.10 – 0.15	0.673	0.07	-0.18 – 0.31	0.603	0.15	-0.13 – 0.44	0.296
log(vital records)	**0.65**	0.59 – 0.71	<0.001	**0.77**	0.73 – 0.81	<0.001	**0.94**	0.88 – 1.00	<0.001
log(mean vital records)	**0.42**	0.35 – 0.49	<0.001	**0.29**	0.21 – 0.38	<0.001	**0.11**	0.00 – 0.21	0.040
Parameters	σ^2_{within} = 0.07 σ^2_u = 0.01 θ = 0.47			σ^2_{within} = 0.04 σ^2_u = 0.05 θ = 0.81			σ^2_{within} = 0.06 σ^2_u = 0.07 θ = 0.80		
Observations	n = 670 T = 10-20 N = 35			n = 729 T = 1-25 N = 35			n = 798 T = 14-24 N = 35		
R^2 / R^2 Adjusted	0.907 / 0.905			0.828 / 0.824			0.725 / 0.720		

Finally, we use the regression coefficients from the within-between models to adjust police-recorded homicide rates (per 100,000 population), enabling the estimation of counting rules-adjusted homicide rates across countries. For this purpose, we select a set of relevant counting rules that our regression models have shown to be most likely affecting police-recorded homicide across countries. Specifically, we use the data collection stage and the legal inclusion or exclusion criteria influencing homicide recording (terrorism, and assisting or

instigating suicide). We conduct three nested adjustments: first, we adjust national homicide rates based solely on the calculated mean correspondence rate for each country and across the three measures of vital statistics considered; second, we adjust homicide rates to account for under-recording and the data collection stage (input versus other); and third, we adjust rates to include under-recording, the data collection stage, and legal inclusions and exclusions.

These adjusted country homicide rates and the original rates derived from Eurostat are presented in Figure 5. Our adjustments illustrate the large impact that counting rules have on the reliability of cross-country comparisons of police-recorded homicide and international rankings. The Mean Absolute Change suggests that, on average, the adjusted rates differ from the original rates by 0.3 points, while the rankings shift, on average, by 4.2 positions. For example, Portugal, initially ranked in position twenty-seventh (at the low-tier homicide rate within Europe), moves to position eighteenth after adjusting for under-recording, and seventeenth when the data collection stage and legal-definitional variations are also accounted for. Portugal's homicide rate increased by 51% after applying out adjustments. Similar shifts are observed for countries such as Iceland (rising from thirty-sixth to twenty-sixth), North Macedonia (from eighteenth to nineth), and Slovenia (from thirtieth to twenty-fourth). Albania, originally ranked sixth, climbs to second after adjustments for under-recording and counting rules, with a 94% increase in its homicide rate following our adjustments. Conversely, Slovakia, Germany, and France experience the largest declines in rank, falling from twelfth, twenty-second and seventeenth to twenty-third, thirty-third and twenty-fifth, respectively. A similar decrease is noted for Austria.

Overall, with the sole exception of France and Ireland, all Western European countries show decreases in homicide rates after adjusting for under-recording and counting rules. On the other hand, all Southern European countries except Spain and Turkey rise in the rankings following these adjustments. Most Balkan countries—except Montenegro and Bosnia and Herzegovina—also rise in the rankings. In Central Europe, all countries except Hungary and Czechia see decreases in rank. Eastern Europe displays mixed trends: Estonia and Lithuania drop in rank, while Latvia and Romania rise. Finally, our adjustments also impact countries in the Northern European region in mixed ways: Iceland and Sweden rise in rank, while all other countries either experience declines or remain in the same position.

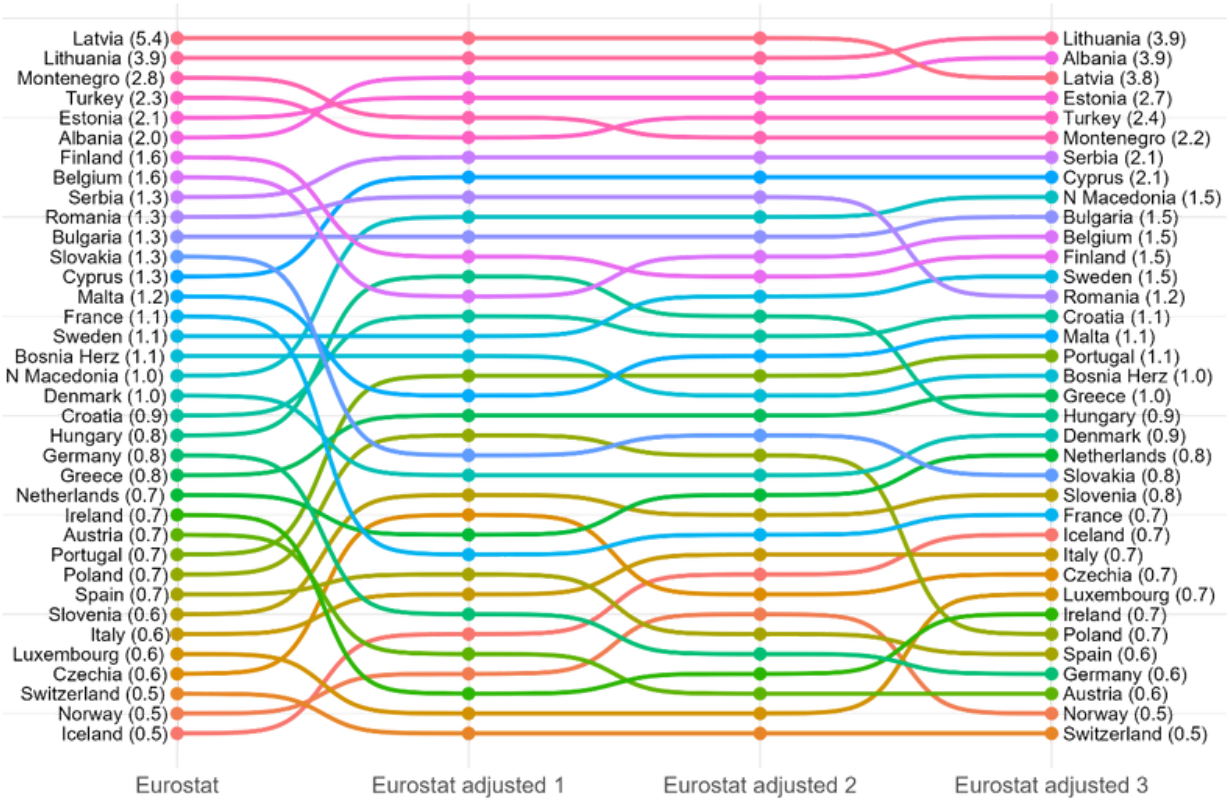

Figure 5 *Eurostat homicide rate per 100,000 population adjusted for correspondence rates (adjustment 1), data collection stage (adjustment 2) and legal-definitional variations (adjustment 3). Only includes countries for which full information is available.*

5. Discussion

Cross-national criminological research has predominantly focused on homicide as the crime type least affected by recording inconsistencies, operating under the assumption that its severity ensures more reliable measurements compared to other offenses (LaFree 2021). Our study shows that this assumption requires significant nuancing. Statistical counting rules and legal definitions for homicide vary extensively across European countries, and these methodological differences affect the reliability of cross-national homicide comparisons.

Our findings reveal two patterns. First, countries recording crimes at the input stage—when incidents are first reported to authorities, usually the police—consistently report higher homicides than those using process-based or output-based recording systems. Second, broader legal definitions of homicide, which include additional categories such as terrorism-related deaths and cases of assisting or instigating suicide, are associated with significantly higher homicide records. These findings align with previous research on how measurement disparities distort cross-national crime comparisons (Aebi 2008; Harrendorf 2018; von Hofer 2000) and extend that work by using more advanced statistical techniques to quantify the specific impact of different counting rules on homicide records.

The influence of counting rules on national homicide statistics has significant implications for comparative criminological research. Beyond merely distorting perceptions of which countries exhibit higher or lower homicide rates, these methodological inconsistencies may undermine efforts to identify and understand cross-national predictors of homicide variation (Nivette 2011; Pina-Sánchez et al. 2023). For instance, when adjusting for counting rules, Albania's homicide rate increases by 94%, Cyprus's by 62% and Serbia's by 57%, leading to substantial shifts in international rankings. Such discrepancies raise concerns about whether observed patterns in unadjusted data reflect genuine crime levels or are merely artifacts of differing methodologies. These distortions not only challenge the reliability of comparative crime analyses but also hinder the development of evidence-based policies aimed at addressing international homicide disparities. Moreover, they pose obstacles to advancing macro-level theories that seek to explain cross-national variations in crime levels and trends.

We emphasize that this study captures only two sources of cross-national variation in homicide recording: statistical counting rules and legal definitions. We have not addressed substantive factors beyond actual crime levels, such as cross-country differences in crime reporting propensities and the likelihood of crime being recorded by authorities (Boivin and Cordeau 2011; Estienne and Morabito 2016). Nor have we examined policy priorities that influence the recording of certain criminal behaviors (Aebi 2010). These factors vary significantly across nations and evolve over time. As a result, our study likely underestimates the full extent of cross-national disparities in homicide recording.

Our findings have implications extending well beyond homicide research in Europe. First, homicide is internationally recognized as the crime type with the highest recording rates and arguably the fewest measurement issues. The methodological inconsistencies we identified for homicide would almost certainly be magnified for other crime types where cross-national variation in counting rules is even more pronounced (Aebi et al. 2021; Eurostat 2024). For instance, non-lethal violence (Enzmann and Podana 2010), rape and sexual offenses (Chon and Clifford 2021; von Hofer 2000), property crimes (Gruszczyńska and Heiskanen 2012), and emerging crime modalities such as fraud and cybercrime, whose definitions remain largely unstandardized internationally (Correia-Hopkins 2024), will face even greater cross-national comparability challenges.

Second, our geographic focus on Europe—a region with relatively standardized crime recording practices—likely represents a best-case scenario for data comparability. The European context benefits from standardization efforts by the United Nations Office on Drugs and Crime (UNODC) through its ICCS (Bisogno et al. 2015), as well as initiatives by Eurostat and the long-running *European Sourcebook* project (Aebi et al. 2024). In contrast, regions with less standardized recording practices would likely exhibit even greater cross-national disparities than those observed in our analysis. This issue is particularly relevant to cross-continental crime comparisons, which are increasingly facilitated by open data initiatives (Buil-Gil et al. 2024).

While vital records are often proposed as an alternative to police statistics for measuring homicide cross-nationally (Kanis et al. 2017; Rogers and Pridemore 2023), our analysis suggests caution in relying on this approach. Treating WHO Mortality data or other vital statistics as the *gold standard* introduces distinct yet equally problematic challenges for comparative analyses, as well as for policy and theoretical developments. Beyond the well-documented limitations of vital statistics—such as geographic coverage gaps and low recording rates in certain regions (Andersson and Kazemian 2018; Herre and Spooner 2023; Santos and Testa 2024)—there is limited transparency regarding countries' compliance with standardized definitions of homicide in these systems (Smit et al. 2012) and the statistical rules applied in compiling them. WHO vital statistics are based on the classification of causes of death using the *International Classification of Diseases* (ICD). However, while international guidelines exist for compiling this data, compliance with these standards is not systematically documented in international databases. As a result, researchers cannot empirically assess how variations in counting rules affect vital records across nations, nor can they predict their impact on cross-country comparisons. Furthermore, for most crime types beyond homicide, vital records simply do not exist. Consequently, until ongoing efforts to relaunch cross-national crime surveys (Bijleveld 2023; van Dijk et al. 2022) reach success, researchers will have to rely on official crime measures, mainly police and conviction statistics.

Our analysis also suggests that documenting counting rules can enhance the reliability of cross-national crime data comparisons. By identifying and quantifying the impact of specific counting rules on national homicide rates, we showed that methodological adjustments can substantially improve cross-national comparability. When we adjusted homicide rates based on data collection stage and legal definitional variations, we observed significant changes in international rankings that likely better reflect genuine cross-national differences in homicide prevalence. This result aligns with those of Kühn et al. (2025), who examined the impact of two different sets of counting rules on the population of sentenced prisoners in Europe based on the principal offense for which they were convicted.

These findings also have implications for research examining predictors of cross-national homicide variation. Previous studies have reached inconsistent conclusions regarding which factors significantly predict homicide rates across countries, with results varying depending on whether analyses use police-recorded data or vital statistics (Nivette 2011). Our findings suggest that accounting for counting rule variations in statistical models may help reconcile these inconsistencies.

Several limitations of this study should be acknowledged. First, as noted earlier, we examined only statistical counting rules and legal definitions affecting crime recording, not substantive or policy-driven factors. Second, our adjustment methodology, while representing an improvement over unadjusted comparisons, relies on estimated associations between counting rules and recorded homicide that may not fully capture the complexity of these relationships. Third, our analysis focused on European countries with relatively complete data,

potentially limiting generalizability to other regions. Fourth, vital statistics used as comparison benchmarks have their own limitations and do not represent true gold standards for homicide measurement.

6. Conclusion

This study shows that statistical counting rules and legal definitions significantly affect the reliability of cross-national homicide comparisons based on police statistics. Despite homicide being widely recognized as the crime type least affected by recording inconsistencies, we found substantial cross-national variation in how homicides are counted and recorded in official statistics. Countries recording data at the input stage (when crimes are first reported) show higher homicide rates than those using process- or output-based systems. Similarly, countries with more expansive legal definitions of homicide, particularly those including terrorism-related deaths and assisted suicide, record significantly higher homicide rates.

These findings have significant implications for comparative criminological research. The substantial shifts in country rankings observed when adjusting for counting rules—with some countries moving more than ten positions—suggest that methodological differences can fundamentally distort our understanding of cross-national homicide patterns. This raises questions about the validity of previous comparative research that failed to account for these methodological differences. If similar issues exist for other crime types and in regions with less standardized recording practices, the challenges for comparative criminology are even more substantial than previously recognized.

We identify three ways in which this research enhances understanding in the field. First, we provide empirical evidence on how specific counting rules influence recorded homicide, quantifying these impacts across 41 European countries over 25 years. Second, we introduce a technique for adjusting homicide rates to account for cross-national differences in counting rules, improving the comparability of international crime statistics. Third, we highlight how methodological differences can distort cross-national crime comparisons, underscoring the need for caution when interpreting unadjusted international crime data.

Drawing from our findings, we propose several recommendations to improve the reliability of cross-national crime data. Institutions such as Eurostat, WHO, and IHME should strengthen efforts to document counting rules across countries. Similarly, efforts to promote standardized definitions (such as the ICCS) and recording practices deserve also to be encouraged. For researchers conducting cross-national crime analyses, we recommend incorporating counting rule variables as controls in statistical models examining crime predictors. For policymakers relying on cross-national crime comparisons, we suggest prioritizing adjusted crime rates to avoid the use of distorted rankings, potentially leading to misplaced policy priorities or ineffective interventions. For example, the EU administers the Internal Security Fund (ISF) to strengthen the capabilities of law enforcement agencies, with a budget of approximately €1.9 billion for the 2021-2027 period. When allocating this funding across member states, crime rates in their raw, non-adjusted form should not serve as the primary reference, as this may lead to inaccurate assessments and misallocation of resources.

Future research could extend this analysis in several directions. First, similar examinations of counting rule effects could be conducted for other crime types, particularly those with less standardized definitions across countries. Second, researchers could develop methods to capture substantive factors affecting crime recording propensities, including variations in reporting likelihood and police recording practices (Boivin and Cordeau 2011). Third, future work should explore how combining police records with other data sources, including victimization surveys and health records, might provide more robust cross-national crime measures.

In conclusion, while cross-national crime comparisons can offer valuable insights into global crime patterns, their reliability hinge on recognizing and addressing methodological differences across countries. By documenting how counting rules influence recorded crime rates and developing adjustment methodologies to account for these variations, researchers can enhance the accuracy of comparative criminological research, ultimately strengthening its contributions to both theoretical advancements and evidence-based policymaking.

Acknowledgements

The author would like to thank the Reading Sessions in Quantitative Criminology (RESQUANT) of The University of Manchester, and particularly Thiago Oliveira, Nico Trajtenberg, Reka Solymosi, Ken Pease, Niels Blom, Tomáš Diviák, Nicola Fox, and Benjamin Palfreeman-Watt, for comments that greatly improved the manuscript.

References

Aebi MF (2008) Measuring the Influence of Statistical Counting Rules on Cross-National Differences in Recorded Crime. In: Aromaa K, Heiskanen M (eds) Crime and Criminal Justice Systems in Europe and North America 1995-2004. United Nations European Institute for Crime Prevention and Control, Finland, pp 196-214

Aebi MF (2010) Methodological Issues in the Comparison of Police-Recorded Crime Rates. In: Shoham SG, Knepper P, Kett M (eds) International Handbook of Criminology, CRC Press, Boca Raton, pp 211-227

Aebi MF, Caneppele S, Harrendorf S, Hashimoto YZ, Jehle JM, Khan TS, Kühn O, Lewis C, Molnar L, Smit P, Þórisdóttir R (2021) Original Data of the European Sourcebook of Crime and Criminal Justice Statistics 2021, 6th edn. Series UNILCRIM, Lausanne

Aebi MF, Caneppele S, Harrendorf S, Hacin R, Hashimoto YZ, Jehle JM, Kensey A, Khan TS, Molnar L, Þórisdóttir R, Smit P (2024) European Sourcebook of Crime and Criminal Justice Statistics 2024, 7th edn. Series UNILCRIM, Lausanne

Albrecht HJ (1989) Comparative Research on Crime and Delinquency — The Role and Relevance of National Penal Codes and Criminal Justice Systems. In: Klein MW (ed) Cross-National Research in Self-Reported Crime and Delinquency. Springer, Dordrecht, pp 227-248

Alkema L, You D (2012) Child Mortality Estimation: A Comparison of UN IGME and IHME Estimates of Levels and Trends in Under-Five Mortality Rates and Deaths. Plos Med 9(8):e1001288. https://doi.org/10.1371/journal.pmed.1001288

Andersson C, Kazemian L (2017) Reliability and Validity of Cross-National Homicide Data: A Comparison of UN and WHO Data. Int J Comp Appl Crim Justice 42(4):287–302. https://doi.org/10.1080/01924036.2017.1370676

Bennett RR (2004) Comparative criminology and criminal justice research: The state of our knowledge. Justice Q 21(1):1–21. https://doi.org/10.1080/07418820400095721

Bennett RR, Lynch JP (1990) Does a Difference Make a Difference? Comparing Cross-National Crime Indicators. Criminology 28(1):153-181. https://doi.org/10.1111/j.1745-9125.1990.tb01322.x

Bijleveld C (2023) European Criminology needs European Data: The case for a pan-European crime and victimization survey. Eur J Criminol 20(3):785-791. https://doi.org/10.1177/14773708231174658

Bisogno E, Dawson-Faber J, Jandl M (2015) The International Classification of Crime for Statistical Purposes: A New Instrument to Improve Comparative Criminological Research. Eur J Criminol 12(5):535-550. https://doi.org/10.1177/1477370815600609

Boivin R, Cordeau G (2011) Measuring the Impact of Police Discretion on Official Crime Statistics: A Research Note. Police Q 14(2):186-203. https://doi.org/10.1177/1098611111404179

Buil-Gil D, Bui L, Trajtenberg N, Diviak T, Kim E, Solymosi R (2024) Diversifying Crime Datasets in Introductory Statistical Courses in Criminology. J Crim Justice Educ 36(1):19-45. https://doi.org/10.1080/10511253.2024.2334706

Chon DS, Clifford JE (2021) The Impacts of International Rape Laws Upon Official Rape Rates. Int J Offender Ther 65(2-3):244-261. https://doi.org/10.1177/0306624X20952399

Correia-Hopkins S (2024) A Framework for Measuring the Quality of Police Recorded Cybercrime Data, Illustrated through a UK/USA Comparison. In: Huey L, Buil-Gil, D (eds) The Crime Data Handbook. Bristol University Press, Bristol, pp 260-272

CoE - Council of Europe (1999) European Sourcebook of Crime and Criminal Justice Statistics. Council of Europe, Strasbourg

Croissant Y, Millo G (2008) Panel Data Econometrics in R: The plm Package. J Stat Softw 27(2):1-43. https://doi.org/10.18637/jss.v027.i02

Dawson A (2018) Police Legitimacy and Homicide: A Macro-Comparative Analysis. Soc Forces 97(2):841–866. https://doi.org/10.1093/sf/soy043

De Candolle A (1987[1830]) Considérations sur la statistique des délits. Deviance Soc 11(4):352-355.

De Candolle A (1987[1832]) De la statistique criminelle. Deviance Soc 11(4):356-363.

Eisner M (2023) Towards a Global Comparative Criminology. In: Liebling A, Maruna S, McAra L (eds) The Oxford Handbook of Criminology. Oxford University Press, Oxford, pp 75-98

Enzmann D, Podana Z (2010) Official Crime Statistics and Survey Data: Comparing Trends of Youth Violence between 2000 and 2006 in Cities of the Czech Republic, Germany, Poland, Russia, and Slovenia. Eur J Crim Policy Re 16:191–205. https://doi.org/10.1007/s10610-010-9121-z

Estienne E, Morabito M (2015) Understanding Differences in Crime Reporting Practices: A Comparative Approach. Int J Comp Appl Crim Justice 40(2):123–143. https://doi.org/10.1080/01924036.2015.1086397

Eurostat (2024) Crime and Criminal Justice: Reference Metadata in Single Integrated Metadata Structure. https://ec.europa.eu/eurostat/cache/metadata/en/crim_sims.htm Accessed 31 October 2024

Fairbrother M (2014) Two Multilevel Modeling Techniques for Analyzing Comparative Longitudinal Survey Datasets. Polit Sci Res Meth 2(1):119–140. https://doi.org/10.1017/psrm.2013.24

Frantz E (2019) The Legacy of Military Dictatorship: Explaining Violent Crime in Democracies. Int Polit Sci Rev 40(3):404-418. https://doi.org/10.1177/0192512118769079

Gibson J, Kim B (2008) The Effect of Reporting Errors on the Cross-Country Relationship between Inequality and Crime. J Dev Econ 87(2):247-254. https://doi.org/10.1016/j.jdeveco.2007.12.001

Gruszczyńska BZ, Heiskanen M (2012) Trends in Police-recorded Offences. Eur J Crim Policy Re 18:83–102. https://doi.org/10.1007/s10610-011-9160-0

Harrendorf S (2012) Offence Definitions in the European Sourcebook of Crime and Criminal Justice Statistics and Their Influence on Data Quality and Comparability. Eur J Crim Policy Re 18(1):23-53. https://doi.org/10.1007/s10610-011-9161-z

Harrendorf S (2018) Prospects, Problems, and Pitfalls in Comparative Analyses of Criminal Justice Data. Crime Justice 47(1):159-207. https://doi.org/10.1086/696042

Heise LL, Kotsadam A (2015) Cross-National and Multilevel Correlates of Partner Violence: An Analysis of Data from Population-Based Surveys. Lancet Glob Health 3(6):E332-E340. https://doi.org/10.1016/S2214-109X(15)00013-3

Herre B, Spooner F (2023) Homicide Data: How Sources Differ and When to Use Which One, OurWorldinData. https://ourworldindata.org/homicide-data-how-sources-differ-and-when-to-use-which-one Accessed 2 November 2024

Kanis S, Messner SF, Eisner MP, Heitmeyer W (2017) A Cautionary Note about the Use of Estimated Homicide Data for Cross-National Research. Homicide Stud 21(4):312-324. https://doi.org/10.1177/1088767917715670

Kesteren J van, Dijk J van, Mayhew P (2014) The International Crime Victims Surveys: A Retrospective. Int Rev Vict 20(1):49-69. https://doi.org/10.1177/0269758013511742

Killias M, Rau W (2000) The European Sourcebook of Crime and Criminal Justice Statistics: A New Tool in Assessing Crime and Policy Issues in Comparative and Empirical Perspective. Eur J Crim Policy Re 8:3-12. https://doi.org/10.1023/A:1008767709296

Koeppel MDH, Rhineberger-Dunn GM, Mack KY (2013) Cross-National Homicide: A Review of the Current Literature. Int J Comp Appl Crim Justice 39(1):47–85. https://doi.org/10.1080/01924036.2013.836676

LaFree G (1999) A Summary and Review of Cross-National Comparative Studies of Homicide. In: Smith MD, Zahn MA (eds) Homicide: A Sourcebook of Social Research. SAGE, Thousand Oaks, pp 125-148

LaFree G (2021) Progress and Obstacles in the Internationalization of Criminology. Int Criminol 1:58-69. https://doi.org/10.1007/s43576-021-00005-2

Marshall IH, Block CR (2004) Maximizing the Availability of Cross-National Data on Homicide. Homicide Stud 8(3):267-310. https://doi.org/10.1177/1088767904265455

Mathers CD (2020) History of Global Burden of Disease Assessment at the World Health Organization. Arch Pub Health 78:77. https://doi.org/10.1186/s13690-020-00458-3

Mundlak Y (1978) On the Pooling of Time Series and Cross Section Data. Econometrica 46(1):69-85. https://doi.org/10.2307/1913646

Murray CJL, Lopez AD, Wibulpolprasert S (2004) Monitoring Global Health: Time for New Solutions. BMJ 329:1096. https://doi.org/10.1136/bmj.329.7474.1096

Nivette AE (2011) Cross-National Predictors of Crime: A Meta-Analysis. Homicide Stud 15(7):103-111. https://doi.org/10.1177/1088767911406397

Pina-Sánchez J, Buil-Gil D, Brunton-Smith I, Cernat A (2023) The Impact of Measurement Error in Regression Models Using Police Recorded Crime Rates. J Quant Criminol 39:975-1002. https://doi.org/10.1007/s10940-022-09557-6

Quetelet A (1831) Recherches sur le penchant aux différens ages. M. Hayez, Brussels

R Core Team (2024) R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing. https://www.R-project.org/ Accessed 3 November 2024

Rogers ML, Pridemore WA (2023) A Review and Analysis of the Impact of Homicide Measurement on Cross-National Research. Annu Rev Criminol 6:447-470. https://doi.org/10.1146/annurev-criminol-030521-102909

Santos MR, Testa A (2024) Global Trends in Homicide: A Comparison between the UNODC Homicide Data and the WHO Mortality Database. In: Burgason KA, DeLisi M (eds) Routledge Handbook of Homicide Studies. Routledge, New York, pp 7-40

Smit PR, De Jong RR, Bijleveld CC (2012) Homicide Data in Europe: Definitions, Sources, and Statistics. In: Liem MCA, Pridemore WA (eds) Handbook of European Homicide Research. Springer, New York, pp 5–23

Sturup J (2018) Comparing Serial Homicides to Single Homicides: A Study of Prevalence, Offender, and Offence Characteristics in Sweden. J Invest Psychol Off 15(2):75-89. https://doi.org/10.1002/jip.1500

Tonry M (2015) Is Cross-National and Comparative Research on the Criminal Justice System Useful? Eur J Criminol 12(4):505-516. https://doi.org/10.1177/1477370815581699

UNODC (2023) Global Study on Homicide 2023. United Nations, New York

van Dijk J, Nieuwbeerta P, Joudo Larsen J (2022) Global Crime Patterns: An Analysis of Survey Data from 166 Countries Around the World, 2006–2019. J Quant Criminol 38:793-827. https://doi.org/10.1007/s10940-021-09501-0

von Hofer H (2000) Crime Statistics as Constructs: The Case of Swedish Rape Statistics. Eur J Crim Policy Re 8(1):77-89. https://doi.org/10.1023/A:1008713631586

World Health Organization (2014) Global Status Report on Violence Prevention 2014. WHO Library, Geneva

Footnotes

1. Of the 34 homicide studies reviewed by LaFree (1999), eleven used vital records made available by the WHO, whereas the majority (26 studies) used police-recorded crime data from sources such as Interpol, the United Nations, or the Comparative Crime Data File. About a decade later the trend changed, with studies relying on vital records becoming the norm. In Koeppel et al.'s (2015) review of 50 homicide studies published between 1997 and 2011, 26 of them relied on vital records published by WHO, twelve used police-recorded Interpol data, one used United Nations survey data, with the remaining eleven based on a combination of datasets. ↩

2. Among Eurostat countries, the GHE primarily relies on vital registration data in 25 out of 39 nations (64%), criminal justice data in ten of them (26%), adjusted criminal justice data in one (Turkey), estimates with country data in two (Albania and Montenegro), and estimates without country data in one (Bosnia and Herzegovina). ↩

3. The GBD project was initially commissioned by the WHO in 1992, but it has operated as an independent program since 2007. Originally, IHME followed the same standards and procedures as the WHO's GHE; however, a series of data access and methodological disagreements between WHO and IHME led to different approaches for estimating causes of death across countries (Mathers 2020; Murray et al. 2004). ↩

4. Eurostat data recorded between 1998 and 2007, and between 2013 and 2022, is openly available from the website of the EU: https://ec.europa.eu/eurostat/web/crime/database. Data recorded between 2008 and 2013 is available from a different URL within the website of the EU: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Archive:Crime_and_criminal_justice_statistics,_data_2008-2013#Detailed_tables. ↩

5. While the magnitude of the correspondence rates varies significantly depending on the vital statistics measure used, all three correspondence rates are moderately correlated with one another. Bivariate correlations range from 0.53 (between correspondence rates calculated from the two WHO sources, GHE and Mortality) to 0.58 (between Mortality and IHME) and 0.71 (between IHME and GHE). Overall, correspondence rates derived from GHE and IHME appear to be much more consistent than those based on Mortality records. ↩