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Assessing the Validity of Open-Source Biographical Data in Terrorism Research

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ABSTRACT

A multitude of studies in terrorism research depend on biographical data gathered through the cliometric method. This technique entails reconstructing and aggregating demographic and socio-economic data on terrorism offenders from publicly accessible sources. A notable limitation of this method is the substantial number of missing values. Researchers often employ this data collection strategy as comprehensive official sources are not publicly accessible and are rarely provided to researchers due to privacy concerns, among other factors. In this study, we analyze original data on 53 convicted Islamist terrorism offenders, collected from both publicly available media data and court records. We concentrate on and compare a number of demographic, socio-economic, and biographic variables. The insights derived from these analyses hold important implications for the reliability of biographical research that relies on open-source data.

Introduction

Numerous studies in terrorism research rely on open-source data. Researchers employ a data collection process that involves gathering information from various publicly available sources, such as newspaper articles, books, documentaries, online blogs, and social media platforms. This particular approach has been referred to as "cliometrics," as termed by Klausen et al.[1] The primary objective of this methodology is to convert the qualitative data extracted from these public records into numerical observations, enabling both descriptive and, on occasion, inferential statistical analysis. Some prominent examples of this approach for terrorism event data are the The International Terrorism: Attributes of Terrorist Events (ITERATE) datasets[2] or the Global Terrorism Database (GTD).[3]

This methodology is not only used for gathering information on terrorist events but also for aggregating biographical data on perpetrators. For instance, in their pioneering study, Ami Pedahzur, Arie Perliger, and Leonard Weinberg conducted data gathering and analysis focusing on Palestinian militants.[4] Similarly, Alan Krueger and Jitka Malečková analyzed data on deceased Hezbollah fighters obtained from Tel Aviv University.[5] Marc Sageman also employed this method to construct an extensive dataset of global jihadist terrorists, which he further analyzed in his books *Understanding Terror Networks*[6] and *Leaderless Jihad: Terror Networks in the Twenty-First Century*.[7] These influential authors played key roles in advancing the application of this method in studying terrorism.

During the Syrian Civil War, as a significant influx of foreign fighters traveled to Syria and Iraq to join the ranks of the self-proclaimed Islamic State, this methodology regained popularity among terrorism scholars. A multitude of studies emerged, leveraging open-source data to examine the biographies of foreign fighters from various countries. Noteworthy examples include research on

the United Kingdom by Lyall,[8] on Germany by Reynolds and Hafez[9] and Kanol,[10] on Belgium by Bakker and de Bont,[11] on France by Roy,[12] and on the Netherlands by Bergema and van San,[13] among others. These studies illustrate the extensive use of open-source data in exploring the backgrounds and trajectories of foreign fighters.

There are numerous reasons why terrorism researchers have turned to open-source data. As LaFree asserts "most of the data collection methods used by social scientists to study ordinary crime are difficult or impossible to use in the case of terrorism."[14] For instance, it is very difficult to collect "self-report" survey data, given the covert and clandestine nature of terrorism activities. But the reliance on open-source data also stems from the unavailability of official sources, such as court records, police case files, psychological assessments conducted by court-appointed experts, police investigations, and court judgments. These official sources are considered more reliable and comprehensive in providing accurate information about the perpetrators' biographies.[15] However, due to concerns regarding data protection and other legal considerations, they are not publicly accessible in most cases. Consequently, researchers face cumbersome accreditation processes to gain access to these restricted data, often resulting in significant time delays and without guaranteeing successful access. Hence, researchers turn their focus towards publicly accessible open-source materials as a means to gather extensive information, utilizing the aggregated data to reconstruct the biographies of the perpetrators.

However, the validity of this type of data remains relatively unknown, and there are several limitations associated with this methodology that may impact the credibility of the findings. Two main concerns include the prevalence of missing values and the tendency to treat secondary data as if it were primary data. It is important to recognize that the information presented in these sources reflects the interpretation of reality by journalists, reporters, public prosecutors, judges, or authors. Furthermore, journalists may possess additional information, such as an individual's problematic family history, but they may opt not to include it in their reports due to perceived irrelevance or limitations in article space. Consequently, researchers cannot confidently conclude that an individual lacks any problematic family history solely based on the absence of such information in a newspaper article. In other words, the lack of information on certain variables does not necessarily imply their absence, leading to them being coded as missing values in the analysis. Thus, interpreting and drawing conclusions from data that contain a large number of missing values can be considered problematic, as these gaps may obscure important insights or introduce potential biases.[16] To some extent, similar concerns may arise regarding the accuracy of court records. Court records involve multiple actors and undergo extensive discussions and revisions prior to reaching a court decision. Although this process enhances the likelihood of providing a more accurate depiction of the events and individuals involved, it also promotes a selected reality shaped from the legal perspective. The concentration of information regarding (the causes of) the criminal act also means that certain information may remain unmentioned.[17]

Initial efforts have been made to analyze the reliability of open-source data. For instance, Chermak and colleagues examined the reliability of open-source terrorism databases for homicide events committed by far-right extremists.[18] While their study is among the first to assess the reliability of open-source databases for terrorism events, it leaves unanswered the question of the reliability of individual-level variables—specifically, those concerning the terrorist perpetrator—when collected from open-source data. Beyond terrorism research, Parkin and Gruenewald investigated the reliability of open-source data on homicide.[19] They found that open-source data could be as effective as official data in identifying the individual- and situational-level characteristics of homicide victims.

This study builds on this body of literature and aims to examine the potential disparities between data derived from open-source records and court records. Specifically, we compare the data of German terrorism offenders collected from these two sources across various demographic, socio-economic, and biographical variables. Furthermore, we focus on analyzing the contexts of perpetrator radicalization to assess whether there are significant deviations between the information obtained from open-source records and court records. By conducting this comparative analysis, we seek to shed light on the potential discrepancies and provide insights into the reliability and validity of data obtained from these distinct sources.

In the following, we briefly review the available studies that utilize open-source data or data from case files to investigate biographies of perpetrators of Islamist terrorism. We then describe our research strategy and methods. We describe our data gathered from open sources and court records, along with the coding procedures employed. This is followed by the presentation of our results from the comparative analysis. We conclude with a discussion of our findings and their implications for terrorism research.

Open-source data and criminal case files in terrorism research on Islamist extremism

Open-source data in terrorism research on Islamist extremism

The term "open-source" lacks a universally agreed-upon definition, but scholars commonly refer to two key characteristics of such sources: firstly, open-source data is openly available and legally accessible to the public, and secondly, it is recorded by others, often constituting secondary data.[20] The primary advantage of open-source data for research lies in its accessibility to researchers, enabling the study of hard-to-reach populations and facilitating the investigation of previously challenging research questions. Open-source data can be accessed openly and without the need for covert measures, making it a cost-effective alternative to other types of data.[21]

Besides these advantages there are notable disadvantages and limitations that come with this type of data. The validity of open-source biographical data remains relatively unknown, and there are several limitations associated with this methodology that may impact the credibility of the findings. One primary concern is the prevalence of missing values across various variables. In certain instances, information may be absent for the majority of cases, necessitating researchers to draw conclusions based on available data from a minority of cases. Additionally, researchers often treat secondary data as primary data when utilizing media reports, documentaries, online blogs, and similar sources. It is important to recognize that the information presented in these sources reflects the interpretation of reality by journalists, reporters, or authors. How biases in media reporting practices might prejudice open-source terrorism event data and biographical data have already been discussed in the terrorism and criminological literature.[22] For instance, during the process of reconstructing a perpetrator's radicalization, journalists may overlook or omit crucial information regarding an individual's connections to radical family members residing abroad or their online activities. Furthermore, journalists may possess additional information, such as an individual's problematic family history, but they may opt not to include it in their reports due to perceived irrelevance or limitations in article space. Consequently, researchers cannot confidently conclude that an individual lacks any problematic family history solely based on the absence of such information in a newspaper article. In other words, the lack of information on certain variables does not necessarily imply their absence, leading to them being coded as missing values in the analysis. This presents a challenge for researchers, who might conflate 'unknowns' or missing data with 'no' responses. For example, the *absence of information* about radical family members could be mistakenly interpreted during the analysis phase as indicating the absence of radical family members. Thus, interpreting and drawing conclusions from data that contain a large number of missing values can be considered problematic, as these gaps may obscure important insights or introduce potential biases.

Criminal case files in terrorism research on Islamist extremism

For the analysis in this study, we use German criminal case files. Warg notes that there is no German regulation that defines what a case file is and what it must or must not contain.[23] According to Warg, this represents a deficit, regarding the importance of evidence for fair and transparent criminal proceedings.[24] Besides the missing regulations, case files are defined as a long-term collection and merging of affiliated documents to get a comprehensive overview over concerning and restricted circumstances. In addition, criminal case files must meet certain requirements, for example, they have to document previous procedural steps and

portray a complete and fair picture of the reality. The files must contain all the documents which are required for or might at least be important for the decision making of the court.[25] A criminal case file contains several different types of documents produced by various authorities. Common documents in German criminal case files are for example: the court judgment, the bill of indictment, the (final) report of the police investigation, interrogations, protocols, reports, information disclosed from the Central Criminal Register, the arrest warrants, etc.[26] These documents are often standardized in terms of their structure, but in cases of terrorism offenses there are also some peculiarities compared to standard criminal procedure.[27]

In terrorism research, court documents are generally considered as being more reliable than other sources, such as the media.[28] In common law systems of criminal procedure, this reliability stems from the information being presented under oath during court hearings, with testimonies typically subject to rigorous cross-examination.[29] However, these reasons do not apply to the civil law systems of Continental Europe. In German procedural practice, both sworn witness interrogations and cross-examinations are relatively rare. Nevertheless, it's worth noting that the collection of relevant information in a criminal legal system procedure may be more thorough and systematic compared to a media report, which often follows its own editorial agenda. Comparability between cases is also more attainable in this context, primarily due to the limited variations in documentation among the involved authorities. These authorities are obligated to maintain verifiable records, resulting in a relatively homogeneous structure of the files. Additionally, the case files are typically organized chronologically or according to a logical sequence, further facilitating comparability.[30]

File analysis is a widely employed methodology in criminological and terrorism research, owing to its inherent characteristics. In the subsequent section, we highlight a few exemplary studies that have employed case file analysis within the domain of terrorism research. It is noteworthy that, due to data privacy considerations, the creation of datasets suitable for use beyond the scope of a specific research project is not a common practice. Access to such datasets is typically rigorously restricted to researchers involved in the specific project.[31] For criminal case file analysis, both qualitative and quantitative methods are common. For instance, two case studies were conducted to analyze the radicalization of a German convicted lone-actor terrorist[32] and motives for jihadist terrorist offenses.[33] Böckler et al., Weber and Hamachers, Thijssen et al., and Hecker have all used case files to quantitatively describe convicted terrorists' characteristics originating from Germany, the Netherlands, and France respectively.[34] Similarly, Weenink, and van Leyenhorst and Andreas studied Dutch suspects of terrorism offenses (and the preparation of those) with files from the police and the Dutch Probation Service.[35] Using the European Database of Terrorist Offenders (EDT), Alberda et al. and Duits et al. analyzed convicted and deceased terrorist offenders from five European Union Member States (Netherlands, Belgium, Germany, Austria, and Sweden).[36] These quantitative studies addressed issues like risk factors, critical life events, psychopathology, socioeconomic and sociodemographic background, and the network of the terrorism offender.

While the aforementioned studies relied solely on case files from various authorities, some research has sought to overcome the limitations inherent in using a single source, such as missing data, by integrating both open-source materials and court documents to enhance the reliability of their findings. For instance, Schuurman and Carthy augmented their research with semi-structured interviews, autobiographical materials, and, in certain instances, investigative files provided by the Dutch Public Prosecution Service.[37] In most countries, access to court documents must be granted by the public prosecutor's office or other public institutions. However, in a few countries, legal documents are publicly available. For example, the Australian PIRA study used both court transcripts and news articles.[38] But such examples are very limited in number.

Data and methods

Data collection of open-source data

The open-source data used in this study originates from the Jihadist Radicalization in Europe (JRE) database, a comprehensive collection of individual-level profiles of Islamist extremists from Germany, France, and the UK. Our focus for this research is on the profiles of Islamist extremists from Germany. These profiles encompass individuals who engaged in various activities such as traveling or attempting to travel to conflict regions like Syria, Iraq, or Afghanistan out of their Islamist convictions (commonly known as foreign fighters), individuals involved in planning or conducting Islamist terrorist activity within Europe, those engaged in recruiting others as foreign fighters or propagating propaganda to motivate recruitment, and individuals supporting, justifying, or glorifying violence in the name of Islam through propaganda activities. The JRE-dataset was compiled using a snowball sampling approach to identify individuals fitting one or more of these categories. The data covers the time frame from the year 2000 to 2020. The names of many individuals were initially obtained from various comprehensive resources, including press releases issued by the Office of the Federal Prosecutor whenever terrorism charges were pressed against an individual, which served as a starting point for the data collection process.

To accurately identify individuals, three additional variables were used alongside their names: age at the time of radical activity, migration background (or ethnicity), and city of residence prior to or during mobilization. If any two of these three variables were missing, the individual was excluded from the database. The data was gathered from diverse sources such as newspapers, magazines, books, social media, court files, police records, online blogs, television news reports, and podcasts. To access archives of national and local newspapers, we employed LexisNexis, an electronic journalistic database, and Google. In these search engines, various keywords were used in combination with the individual's name to ensure comprehensive coverage of available information for each variable. For example, when researching the level of education, we would use the following combinations of keywords: "NAME and school* or islam* or terror* or jihad*," "NAME and work* or islam* or terror* or jihad*" etc. After using the specified keywords, if no additional sources were found for a particular profile, the search for sources for that individual would be considered complete.

Data collection of criminal case files

The selection of the criminal case files sample adhered to the following overarching criteria: the criminal proceedings needed to result in convictions related to terrorism offenses (specifically, sections 89a-89c, 91, and 129a-129b of the German Criminal Code—StGB) between the years 2012 and 2019 within Germany. These sections of the German Criminal Code encompass various offenses such as forming terrorist organizations, providing financial support for terrorism, affiliating with a terrorist entity abroad, and engaging in (preparation for) a severe violent act that poses a threat to the state. Data obtained from court records, like media-based data, can introduce biases into research since these records are primarily generated for legal purposes, potentially offering a limited and selective view of defendants and cases, with the potential for crucial information gaps. We acknowledge and further address these limitations in the discussion section below.

According to the Federal Central Criminal Register, there are 280 offenders that are legally convicted for terrorism under the aforementioned sections of the German Criminal Code between 2012 and 2019 in Germany. In order to obtain access to relevant criminal case files, it is necessary to submit an application to the prosecution service, which is in many cases the Office of the Federal Prosecutor. The case files used in this study have previously been employed by three research projects: RadigZ,[39] X-Sonar,[40] and PANDORA.[41] Based on background knowledge of cases and the respective research questions, the cases were selected thematically by the researchers of the projects. All three projects were primarily focused on examining processes of online radicalization. While the RadigZ project had their main focus on terrorism offenders who were active in Germany, the other two research projects concentrated on foreign fighters.

After selecting the cases, the research projects submitted a joint application to request access to the case files. Given the favorable past authorization by the Office of the Federal Prosecutor to use these files for research purposes, we chose to prioritize our application for access to these specific case files. Finally, we received access to 30 case files of which we could use 29 with 53 convicted offenders for this study.

The content of the files available for this stage of research differed between cases and we did not receive access to all document types of all criminal case files selected. One exception is the court judgment, which was available for every case. Concerning the remaining document types, their availability for research purposes (or existence) varies from case to case. However, the judgment holds a distinct significance within the legal process and case documentation: it encompasses the most reliable information regarding the defendant's biography, details the established criminal act, and provides the court's decision.

In the initial stage, our research team of assistants collected qualitative data from crucial documents within the proceedings. The judgment, considered the most reliable, was the primary source from which we extracted data, particularly from sections describing the defendant's personal history and the criminal act. Similar information could also be located within the bill of indictment. Next in line, if available, are documents such as the final investigation report of the police, arrest warrants, and interrogations, which we consulted for relevant information. The qualitative data was converted into quantitative characteristics by the authors using selected variables from the JRE Codebook. To improve our dataset, we expanded our information sources by examining additional documents within the case files to address any remaining gaps (see also Online Appendix).

Given the non-standardized nature of the information in terms of linguistic formulation, quality, and quantity, we followed certain guidelines: In cases of conflicting information within a file, we prioritized information based on document reliability, with precedence given to the judgment, followed by the bill of indictment, the final investigation report, and other documents. When information was implied but not explicitly stated, we cross-referenced multiple clues from different documents to code the variable. For exceptional cases and questions arising from linguistic nuances, we sought internal team consultations for resolution.

Matching and merging the datasets

For the analysis we matched the cases in the two datasets and subsequently merged the data. The first step involved comparing the datasets and identifying cases present in both sets of data. To achieve this, we used the name, alias, and reference number of the court file. As a result, we found 35 definite matches, and 18 additional matches that were slightly uncertain due to limited information in the JRE-dataset (such as incomplete names and absence of reference numbers). After merging the two datasets, the next step involved comparing specific variables of the cases where we had found uncertainties in the matching process (n = 18). This comparison was conducted to confirm that the data indeed pertained to the same individuals. To ensure a one-to-one correspondence, we focused on variables such as year of birth, gender, country of birth, primary location of activity, and citizenship(s) of the defendant. As a result, we successfully retained all 53 individuals in the analysis.

Variables of interest

In the following section, we provide a concise literature review to explain the rationale behind selecting our variables of interest. This review is not intended to be exhaustive but rather seeks to highlight relevant literature and identify the variables derived from it.

Demographic variables

In the first step of our analyses, we compare our findings across a range of demographic variables including the year of birth, gender, marital status, citizenship status, country of birth, and migration background, between the court files and the open-source data.

Socioeconomic variables

In the next step, we turn our attention to socioeconomic variables. With the rise of homegrown terrorism within the European context, socioeconomic grievances have resurfaced as a crucial explanatory factor, dominating both academic and public discussions.[42] One central aspect of this discourse revolves around the challenges of multicultural integration. European Muslims hailing from migrant backgrounds often encounter disadvantages in education, labor market access, and occupational attainment.[43] These disparities are often underscored and considered significant contributors to Muslim radicalization in Europe.[44] The theoretical argument draws on traditional economic perspectives, positing that individuals who enjoy economic well-being are more inclined to adhere to the law and less likely to engage in illegal or criminal activities.[45] Among the various socioeconomic factors, disadvantages in employment and education emerge as two influential variables in this context.

However, as LaFree and Schwarzenbach discuss, empirical support for the connection between terrorism and unemployment has been less robust than for conventional forms of crime.[46] For instance, both Bakker[47] and Sageman[48] reported a large number of individuals in their samples who were unemployed. Yet, other research has not identified an overrepresentation of unemployment among terrorism offenders.[49] Similarly, biographical research on the role of education is contingent on the specific context of the study and has often yielded mixed results. Studies conducted outside the Western context have indicated an inverse relationship, with individuals with higher levels of education being disproportionately represented in terrorist groups.[50] However, studies focusing on European countries have revealed significant educational deficiencies among terrorist offenders.[51] In this study, we specifically direct our attention to these two key socioeconomic indicators: the highest *level of educational attainment* and *employment status* at the beginning of the criminal act.

Contexts of radicalization

The literature on terrorism and political violence has identified various contexts of radicalization of terrorism offenders. Terrorism and social movement scholars have extensively documented the significant role of friendship and kinship ties in enabling and facilitating recruitment and mobilization processes. For instance, both Marc Sageman and Petter Nesser have argued that social ties and interpersonal networks play a crucial role in driving terrorism activity.[52] Social network analyses of jihadi foreign fighters have confirmed these observations.[53] Building on the social movement theories, other scholars point to mosques and religious associations as major hubs of jihadi radicalization. For instance, as discussed by Wiktorowicz, mosques and religious associations can serve as a space for activists to meet, communicate, spread their message in religious seminars, and recruit new members.[54]

Another line of literature has proposed that terrorist organizations have been intensifying their recruitment efforts in European prisons and among individuals with a history of engaging in violent and criminal activities. For instance, Neumann highlighted that prisons can be fertile grounds for Islamist recruiters due to the vulnerable environment they present, characterized by social isolation and personal crisis, both of which serve as significant risk factors for radicalization.[55] More recent analyses have focused their attention on online radicalization processes and documented how the Internet and social media facilitated the radicalization of potential recruits.[56] In line with this, Pokalova determined that Internet penetration emerged as a statistically significant predictor of the outflow of foreign fighters from majority non-Muslim countries.[57] One context that has received limited attention in the literature, but emerged as a relevant factor in the radicalization of European foreign fighters, was radicalization abroad. Kanol found that a small but notable share of European foreign fighters had radicalized outside of their country of residence.[58] Instances of radicalization were observed in places like language schools or during visits to relatives in their countries of origin. Building on this literature, we focus on the following contexts of radicalization and explore whether individuals in our sample were radicalized: (a) *by family and friends*, (b) *in mosques and religious associations*, (c) *in prisons*, (d) *online through the Internet or social media*, or (e) *abroad*.

Critical life events

Researchers in terrorism studies have concentrated on critical life events as facilitators of radicalization, with several factors being particularly highlighted. Wiktorowicz argues that personal encounters with loss and hardship can trigger an identity crisis, leading to a cognitive opening.[59] These experiences may encompass various forms, such as the loss of a family member, familial disputes, personal setbacks related to deviant behaviors like substance abuse, or victimization through criminal acts.[60] Consistent with this perspective, Jako, LaFree, and Kruglanski examined the "quest for significance" model and documented that the loss of personal significance, often stemming from experiences like social rejection or abuse, served as a positive predictor for ideologically motivated crimes in the United States, including Islamist extremism.[61] Similarly, in their analysis of Chechen terrorists, Speckhard and Ahkmedova[62] identified traumatic loss and bereavement as significant factors influencing their behavior. Psychological research has also established a connection between the absence of family members, particularly the father, during the socialization process and the likelihood of delinquent behavior.[63] For instance, Markowitz and Ryan argued that father absence, often accompanied by parental conflict, can disrupt the socialization process and lead to reduced parental supervision, thus potentially contributing to delinquency among young individuals.[64] Their longitudinal study provided evidence of how these conditions are likely to foster delinquent behavior in young individuals.

Another type of critical life event that is often cited in the literature is involvement in criminal activities. Crone has argued that endorsing an extremist ideology can "contribute to the transformation of one form of violence into another; it can change regular crime into the political form of crime,"[65] and further asserted that "a prior acquaintance with violent milieus—in Europe or abroad—is more often a precondition for perpetrating terrorism than are extremist opinions."[66] A number of studies focusing on biographies of perpetrators has documented high levels of crime rates among jihadists in Europe.[67] For instance, Bakker reported a high level of criminality among European jihadists: Around a quarter of terrorists in Europe had a criminal record, whereas many of those without a criminal record were known to have some involvement in criminality.[68] Based on this body of literature, we focus on three critical life events: *previous involvement in criminal activity, divorce of parents*, and *the absence of the father in the socialization phase*.

Results

In this section, we present the findings extracted from the two datasets: the criminal case file dataset (CF) and the open-source database (OS). Given the small sample size and the high proportion of missing values in some variables, we refrained from using inferential statistics and instead present results from descriptive analyses. Our sample encompasses 23 individuals (43.4 percent) who were convicted for supporting a terrorist organization, which encompasses activities such as fund transfers, resource provisioning, and service provision. Additionally, 30 individuals (56.6 percent) were convicted for membership in a terrorist organization. Out of the total 53 terrorism offenders, 38 (71.7 percent) either attempted to travel or successfully journeyed to conflict zones like Syria or Iraq. Criminal sentences varied across the sample: 9 individuals (17 percent) received custodial sentences of up to 2 years, 5 (9.4 percent) were sentenced to a range of 2 to 3 years, 12 (22.6 percent) received sentences between 3 and 4 years, while 8 (15.1 percent) were imprisoned for durations spanning 4 to 5 years. A notable subset of 19 individuals (35.8 percent) received sentences exceeding 5 years of incarceration.

Demographic variables

We found that the data for birth year, gender, citizenship, and migration background were very similar in both sources. Since there were no major differences and the results were closely aligned between the datasets, we provide further detailed information about these variables in the Online Appendix.

Marital status

Regarding marital status, there is a notable amount of missing information in the open-source data (14 cases, 35 percent, see Table 1). Roughly half of the sample in both datasets were single. However, compared to the criminal case file dataset, the open-source dataset slightly overestimated the proportion of single offenders and underestimated married and divorced individuals. Information on separation and on being widowed was unavailable in the open-source data.

Country of birth

While there were no major differences in the citizenship status and migration background variables, there was a relatively higher proportion of missing information for the country of birth variable (13 cases, 25 percent, see Table 2). Despite this notable gap, the distribution of countries of birth was relatively even across both datasets. However, the open-source data slightly overestimated the proportion of European origins and underestimated those from South Asia and Former Soviet Republics.

Socioeconomic variables

In the next step of our analysis, we proceed to compare our findings across two key indicators of socioeconomic status: the highest level of educational attainment and the employment status of individuals involved in terrorism.

Education

As shown in Table 3, a notable amount of data is absent within this category in the open-source data, with information present for just slightly over half of the profiles, while no data is available for 17 cases (43 percent). The distribution also exhibited minor variations, with the open-source data overestimating the share of terrorism offenders without a formal education degree (3 cases, 13 percent vs. 2 cases, 5 percent) and underestimating those with a qualification granted at the end of secondary education (*Abitur*; 3 cases, 13 percent vs. 7 cases, 18 percent) and those with vocational training (3 cases, 13 percent vs 9 cases, 23 percent).

Unemployment

As highlighted by social movement scholars, individuals involved in radical Islamist organizations may have deliberately left their jobs to fully engage in religious activism.[69] This emphasizes the need for researchers to carefully consider whether an individual's unemployment was a result of their

Table 1. Comparing the marital status of terrorism offenders between CF and OS data

Data	N	n	Missing	Single	Married	Divorced	Separated	Widowed
CF	40	40 (100 percent)	0 (0 percent)	20 (50.0 percent)	16 (40.0 percent)	2 (5.0 percent)	2 (5.0 percent)	0 (0 percent)
OS	40	26 (65.0 percent)	14 (35.0 percent)	15 (57.7 percent)	10 (38.5 percent)	1 (3.8 percent)	0 (0 percent)	0 (0 percent)

The total N = 40 deviates from 53 because in 13 cases, there were differences in the time of first terrorist activity. We are interested in the marital status before the first terrorist activity. We therefore removed these cases from the analysis.

Table 2. Comparing the country of birth of terrorism offenders between CF and OS data

Data	N	n	Missing	Europe	Germany	MENA	FSR	South-Asia	SSA	Turkey
CF	53	53 (100 percent)	0 (0 percent)	2 (3.8 percent)	33 (62.3 percent)	7 (13.2 percent)	2 (3.8 percent)	4 (7.5 percent)	2 (3.8 percent)	3 (5.7 percent)
OS	53	40 (75.5 percent)	13 (24.5 percent)	3 (7.5 percent)	25 (62.5 percent)	6 (15.0 percent)	0 (0 percent)	1 (2.5 percent)	2 (5.0 percent)	3 (7.5 percent)

MENA = Middle East and North Africa, FSR = Former Soviet Republic, SSA = Sub-Saharan Africa.

Table 3. Comparing the highest level of education attained by terrorism offenders between CF and OS data

Data	N	n	Missing	None	Primary	Abitur	Vocational training	University
CF	40	40 (100 percent)	0 (0 percent)	2 (5.0 percent)	22 (55.0 percent)	7 (17.5 percent)	9 (22.5 percent)	0 (0 percent)
OS	40	23 (57.5 percent)	17 (42.5 percent)	3 (13.0 percent)	13 (56.5 percent)	3 (13.0 percent)	3 (13.0 percent)	1 (4.3 percent)
Difference				−8	−1.5	+4.5	+9.5	−4.3

The total N = 40 deviates from 53 because in 13 cases, there were differences in the time of first terrorist activity. We are interested in the marital status before the first terrorist activity. We therefore removed these cases from the analysis.

Table 4. Comparing the employment status of terrorism offenders between CF and OS data

Data	N	n	Missing	Employed	In education	Unemployed
CF	40	37 (92.5%)	3 (7.5%)	22 (59.5%)	5 (13.5%)	10 (27.0%)
OS	40	23 (57.5%)	17 (42.5%)	12 (52.2%)	5 (21.7%)	6 (26.1%)
Difference				+7.3	-8.2	+0.9

Note: The total N = 40 deviates from 53 because in 13 cases, there were differences in the time of first terrorist activity. We are interested in the marital status before the first terrorist activity. We therefore removed these cases from the analysis.

radicalization rather than the other way around. To account for this phenomenon, we adjust the analysis by considering individuals who intentionally quit their jobs. There were six such cases in the dataset sourced from the court files (refer also to Online Appendix Table S6 for results without this adjustment).

There was a notable divergence in the proportion of missing data between the two datasets regarding employment status (see Table 4). While only 3 cases (8 percent) lacked information in the court files, a substantial 17 cases (43 percent) were missing from the open-source data. Interestingly, despite this disparity, the differences in findings were not as pronounced. Notably, the open-source data and court files demonstrated slight variations in the proportion of employed individuals (60 percent in the court files vs. 52 percent in the open-source data) and those still in education (14 percent vs. 22 percent). However, the incidence of unemployed terrorism offenders was relatively consistent across both datasets (27 percent vs. 26 percent).

Contexts of radicalization

We observed notable differences when examining the primary contexts of radicalization among terrorism offenders in Germany (see Table 5). Most importantly, information regarding the context of radicalization was absent in over half of the cases within the open-source data (28 cases, 52 percent). Interestingly, security agencies were similarly unable to pinpoint the exact radicalization context for 15 cases, resulting in the absence of information for approximately a third of the cases. This particular variable exhibited the highest proportion of missing data within the dataset derived from court files. Furthermore, we found that the open-source data tended to overemphasize the role of friends and family in the radicalization process (15 cases, 60 percent compared to 13 cases, 34 percent), while simultaneously underestimating the significance of mosques and religious associations (4 cases, 16 percent compared to 16 cases, 42 percent) as catalysts for radicalization. However, the disparities were much less pronounced when considering online radicalization, radicalization within prisons, and instances of radicalization occurring abroad.

Table 5. Comparing the introduction to radicalization contexts of terrorism offenders between CF and OS data

Data	N	n	Missing	Friends/Family	Online	Prison	Abroad	Mosque/ Association
CF	53	38 (71.7 percent)	15 (28.3 percent)	13 (34.2 percent)	7 (18.4 percent)	1 (2.6 percent)	1 (2.6 percent)	16 (42.1 percent)
OS	53	25 (47.2 percent)	28 (52.8 percent)	15 (60.0 percent)	4 (16.0 percent)	1 (4.0 percent)	1 (4.0 percent)	4 (16.0 percent)
Difference				−25.8	+2.4	−1.4	−1.4	+26.1

Critical life events

In the next step of our analyses, we turn our attention to critical life events and compare the prevalence of criminal records and problematic family relations in the biographies of terrorism offenders within the open-source data and court files.

Criminality

First, we analyze the results concerning the variable related to prior involvement in criminal activities (see Table 6). Our findings reveal a major disparity in missing values between the open-source dataset and the court files. In the open-source dataset, a substantial number of cases had missing information (40 cases, 76 percent), whereas the court files showed no instances of missing data. This discrepancy in missing values introduces a potential bias in estimating the prevalence of previous convictions. Interestingly, due to the high proportion of missing values in the open-source data, it currently suggests that a majority of terrorism offenders (70 percent) in this dataset have a history of previous convictions. In contrast, the court files indicate a more moderate proportion of convicts (21 percent).

However, we can address this discrepancy by estimating the share of persons convicted earlier from the total cases while assuming that the missing cases have no previous convictions. We need to consider that journalists might have reported on previous criminal convictions only if they had information on such convictions, potentially avoiding mention of the absence of criminal convictions unless provided with such information from police, family, or friends. As a result, this adjustment reduces the stark difference between the two datasets. Analyzing the court files, we observe that 11 cases (21 percent) had prior convictions, whereas in the open-source data, 9 cases (17 percent) were found to have previous convictions. It is also important to highlight that we exclusively coded previous convictions for non-political offenses, encompassing activities like minor offenses, violent incidents, and drug-related incidents. Notably, any prior engagement in political crimes, including affiliations with terrorist organizations or participation in other terrorism-related activities, was not included in the coding process.

Divorce of parents

Next, we proceed with a comparison of the occurrence of divorced parents in the biographies of terrorism offenders, drawing on the two data sources (as illustrated in Table 7). In the dataset derived from court files, information on divorced parents was absent in 13 percent of the cases, while in the open-source dataset, this proportion is around 53 percent. Similar to the criminality variable, it's plausible that journalists or reporters selectively reported familial matters based on reliable

Table 6. Comparing the prevalence of criminality in biographies of terrorism offenders between CF and OS data

Data	N	n	Missing	No previous conviction	Previous conviction	Previous conviction (of total)
CF	53	53 (100 percent)	0 (0 percent)	42 (79.2 percent)	11 (20.8 percent)	11 (20.8 percent)
OS	53	13 (24.5 percent)	40 (75.5 percent)	4 (30.8 percent)	9 (69.2 percent)	9 (17.0 percent)
Difference				+48.8	−48.4	+3.8

Table 7. Comparing the incidence of divorced parents in the biographies of terrorism offenders between CF and OS data

Data	N	n	Missing	No	Yes	Yes (of total)
CF	53	46 (86.8 percent)	7 (13.2 percent)	24 (52.2 percent)	22 (47.8 percent)	22 (41.5 percent)
OS	53	25 (47.2 percent)	28 (52.8 percent)	15 (60.0 percent)	10 (40.0 percent)	10 (18.9 percent)
Difference				−7,8	+7.8	+22.6

Table 8. Comparing the prevalence of absence of father during primary and secondary socialization in biographies of terrorism offenders between CF and OS data

Data	N	n	Missing	No	Yes	Yes (of total)
CF	53	47 (88.7 percent)	6 (11.3 percent)	32 (68.1 percent)	15 (31.9 percent)	15 (28.3 percent)
OS	53	25 (47.2 percent)	28 (52.8 percent)	16 (64.0 percent)	9 (36.0 percent)	9 (17.0 percent)
Difference				+4.1	−4.1	+11.3

information, potentially omitting reference to the absence of such issues in an individual's biography. Consequently, we initially analyze the data by excluding the missing values, revealing an under-representation of divorce prevalence in the open-source data (40 percent of cases compared to 48 percent in the court files dataset). However, the disparity increases to 23 percentage points when considering the missing values as indicative of no divorced parents.

Absence of father

Third, we investigate how often the father was absent during the primary and secondary socialization phase of terrorism offenders (see Table 8). Our analysis reveals that in the open-source dataset there was no information on the majority of the cases (28, 53 percent), but the court files were also not complete (11 percent missing values). When we examine the distribution using only the complete data, we observe quite similar findings across both datasets (32 percent in court files vs. 36 percent in open-source data). However, if we treat the missing information as indicative of the absence of the father in the biography, the discrepancy widens to an 11-point difference between the datasets. The findings reveal that the open-source data potentially underreports the prevalence of absence of the father (9 cases, 17 percent in open-source data vs. 15 cases, 28 percent in court files).

Discussion

In this study, we conducted a comprehensive systematic comparison involving 53 terrorism offenders from Germany, sourced from both court files and open-source data, aiming to assess the reliability of utilizing open-source data in the domain of terrorism research. Our investigation encompassed an analysis of missing value rates and the distribution of relevant variables derived from existing literature. Our examination of demographic variables highlighted a notable level of reliability in the open-source data, demonstrated by minimal missing values and close correspondence in findings between the two datasets. Regarding socioeconomic variables, we identified a discernibly higher occurrence of missing values in the open-source data, yet the findings remained relatively comparable. However, the open-source data exhibited a modest tendency to underestimate the educational achievements and employment rates of terrorism offenders. This divergence potentially offers insight into why certain recent studies, reliant on open-source data, have concentrated on these socio-economic disparities as plausible drivers of radicalization.[70]

Both datasets exhibited a notable proportion of missing information in relation to the variable of radicalization contexts. However, no notable disparities emerged when examining contexts such as prisons, or online radicalization through the Internet or social media. In both datasets, these variables remained at low levels, challenging certain existing literature that emphasizes these contexts as primary breeding grounds for recruitment and mobilization.[71] Notably, the open-source data seemed to give more weight to family and friends as influential factors, while simultaneously downplaying the importance of mosques and religious associations. Despite these distinctions, both datasets underscore the networked nature of radicalization processes.[72] Furthermore, they reinforce the pivotal role of radical mosques and associations, a notion consistent with insights from social movement scholars and recent studies exploring the mobilization of foreign fighters.[73]

The outcomes concerning critical life events were subject to a degree of data interpretation, leading to varying implications for the results. As we previously discussed, the lack of reporting on these

variables could be construed either as missing values or as indicators of their nonexistence within the biographies, consequently influencing the findings. For instance, the open-source data notably amplify the reporting of criminality when excluding cases with absent information, yet strikingly align with the court files when treating cases with missing data as devoid of any criminal records. Thus, careful interpretation is warranted when determining whether the prevalence of criminality is elevated within these biographies and whether it indeed signifies a potential risk factor. To establish a meaningful assessment, these results need to be contrasted with the proportion of criminality among the demographic group at the highest risk of radicalization, namely young males dwelling in urban settings and originating from Muslim-majority countries. This principle holds true for the other two variables under scrutiny as well, where we observed a significant underreporting within the open-source data. Notably, the substantial prevalence of family issues and critical life events in the biographies within the court files requires further investigation. For example, prior public opinion research has demonstrated how weak family and social ties can render individuals more susceptible to religious radicalization.[74]

Our study underscores the significance of transparency regarding the handling of missing values and the awareness of potential biases stemming from these gaps. While some authors, like Jako, LaFree, and Kruglanski,[75] transparently address these issues, others, like Roy,[76] fail to do so. As we have illustrated, these oversights can have a notable impact on the study outcomes. There are also several strategies researchers can employ to address the problem of missing data. These include a variety of imputation methods and assessing whether the data were missing at random.[77] Certainly, these approaches have their own limitations; however, they can successfully be used to investigate the robustness of the findings. Most importantly, it is crucial for researchers to acknowledge the presence of missing data and transparently discuss their strategies for addressing this issue, along with the limitations associated with using such data.

Although selecting a data source depends on the research question and variables of interest, our research underscores the valuable insights derived from court records. This underscores the necessity for authorities to provide access to such court files for terrorism researchers, enriching the available open-source resources for more valid and reliable analyses.

It is important to note that similar to the limitations of media-based data discussed in the Introduction, data derived from court records can also be subject to biases. For instance, several selection biases come into play: due to selection in the criminal legal system, not all individuals who have committed terrorist acts are necessarily convicted, and it may also be possible that some of those convicted are, in fact, innocent. Case files are primarily produced during investigations and legal proceedings, serving the purpose of justifying and legitimizing court decisions rather than being designed for research purposes. As a result, the information contained within case files represents a selected reality, presenting a reduced perspective of the defendant and the case from a third-party standpoint. Due to this selective nature, there is uncertainty regarding the information that may remain unmentioned. While the absence of certain characteristics in the case files could indicate their non-applicability to the individual, it may also signify an information gap.[78] Further limitations of conducting research with criminal case files include the requirement for cases to have been detected or reported (thus not accounting for the "dark figure" of unreported crimes), instances where individual details remain undisclosed due to lack of evidence or testimonies, and restrictions of access. These factors, as highlighted by Weber and discussed by Leuschner and Hüneke, have implications for the scope and relevance of the research.[79]

Moreover, case files comprise various types of documents, but not all documents were available for this study due to the aforementioned reasons. The procedure for obtaining case files, as previously described, introduces a non-random sampling element, which means that we do not possess a strictly randomized sample of Islamist extremists. As a result, our capacity to present universally applicable findings for the entire population of Islamist extremists is limited. Nonetheless, taking into account the estimated total number of cases, approximately 280, an analysis of 53 cases does constitute a substantial portion of this population. Therefore, our findings can be considered relevant to a certain extent within the broader terrorism literature. Nevertheless, it is crucial to recognize that further research with a larger

sample size and cases from jurisdictions other than Germany is necessary to achieve a more confident level of generalization. These limitations also do not impact our ability to compare the two datasets and examine the reliability of the data.

Our study specifically examines Islamist terrorism, which inevitably limits its scope to this particular form of terrorism. However, we acknowledge that the biases and limitations discussed in our study are not exclusive to Islamist terrorism research but are likely applicable to studies on the biographies of perpetrators of other forms of terrorism, such as right-wing or separatist ideologies, as well. Further research could focus on comparing different ideological backgrounds of persons convicted to ascertain whether the findings and limitations identified in this study can be generalized across various forms of extremist ideologies.

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72. Petter Nesser, *Islamist terrorism in Europe* (Oxford University Press, 2018); Sageman, "Understanding Terror Networks"; Wiktorowicz, "Introduction: Islamic Activism."

73. Kanol, "The Role of Socioeconomic Marginalization"; Reynolds and Hafez, "Social Network Analysis."

74. Anselm Rink, and Kunaal Sharma, "The Determinants of Religious Radicalization: Evidence from Kenya," *Journal of Conflict Resolution* 62, no. 6 (2018): 1229–61.

75. Jasko, LaFree, and Kruglanski, "Quest for Significance."
76. Roy, "Jihad and Death."
77. See e.g., G. Lafree, M. A. Jensen, P. A. James, and A. Safer-Lichtenstein, "Correlates of Violent Political Extremism in the United States," *Criminology* 56, no. 2 (2018), 233–68; B. Schuurman, and S. L. Carthy, "Contextualizing Involvement in Terrorist Violence by Considering Non-significant Findings: Using Null Results and Temporal Perspectives to Better Understand Radicalization Outcomes," *PLOS ONE*, 18, no. 11(2023). Determining that the data were missing at random helps ensure that non-significant findings are attributed to "no association" rather than to a Type II error due to missing data.
78. Leuschner and Hueneke, "Möglichkeiten und Grenzen," 466; Weber, "Gerichtsaktenanalyse als Methode," 97; Steffen, "Grenzen und Möglichkeiten," 91.
79. Weber, "Gerichtsaktenanalyse als Methode," 80; Leuschner and Hueneke, "Möglichkeiten und Grenzen," 464.