

# Emerging data sources and the study of genocide: a preliminary analysis of prison data from S-21 security-center, Cambodia

James Tyner · Xinyue Ye · Sokvisal Kimsroy ·  
Zheye Wang · Chenjian Fu

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**Abstract** The geographical and historical analysis of mass violence, such as genocide, has been limited by incomplete data sets. Accordingly, geographers and other social scientists have in recent years attempted to synthesize disparate sources of information in order to provide more robust analyses of the patterns and trends of mass violence. In this article we explore the limitations and opportunities of a unique data set associated with the Cambodian genocide (1975–1979). Specifically, we detail the development of a database using information from a security-center (S-21) associated with the Cambodian genocide (1975–1979). Our intent is to highlight both the challenges and benefits of data analysis in the context of genocide, thus contributing both to the epistemological issues associated with the rigorous analysis of inchoate data sources and also to our concrete knowledge of atrocities associated with Cambodia.

**Keywords** Digital humanities · Emerging data sources · Genocide · S-21 security-center · Cambodia

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J. Tyner · X. Ye (✉) · S. Kimsroy · Z. Wang  
Department of Geography, Kent State University, Kent,  
OH, USA  
e-mail: xye5@kent.edu

C. Fu  
Department of Geology, Kent State University, Kent, OH,  
USA

## Introduction

Geographers, historians, and other social scientists are routinely faced with the challenge of synthesizing disparate and partial data sources. Scholars are also grappling with the difficulties associated with ‘Big Data’ or emerging large datasets, i.e. voluminous sets of data, often real-time in nature, and consisting of structured, semi-structured, and unstructured variables (Graham and Shelton 2013; Frické 2015; Kitchin and McArdle 2016). This holds especially as GIS technologies and methodologies are diffusing not only throughout the social sciences but the humanities as well (Bodenhamer and Harris 2010; Arribas-Bel 2014; Lee and Sui 2015). Such trends, indeed, testify to the growing importance of historical GIS (HGIS) (Knowles 2014; Cromley 2015). However, as Gregory and Healey (2007, 639) explain, “Historical GIS data bases are rarely a simple facsimile of a single source.” Indeed, “because historical databases must rely on primary source documents, the information is frequently scattered, incomplete, inconsistent, and ambiguous” (Giordano and Cole 2011, 145). Moreover, “very little historical data has been digitized, making it necessary for most scholars to create their own HGIS databases from scratch” (Knowles 2014, 208)—a process that is challenging to say the least (Gregory and Healey 2007; Cromley 2015).

In short, scholars interested in reconstructing historical and geographical events are confronted with fractional data sources. Consequently, scholars must

“take data from multiple sources, integrate them in a manner that is sympathetic to the sources’ limitations, and create metadata and documentation to record the sources and standards used” (Gregory and Healey 2007, 639). However, until recently, the analytical possibilities of GIScience applied to massive data sets compiled by perpetrators and discovered by postwar agencies representing victims have been limited due to data availability and data granularity (Beorn et al. 2009, 563).

For those unaccustomed to working with such data sets the challenges may initially be daunting—but the payoff is enormous. On the one hand, geospatial techniques and geo-computational technologies help manage massive amounts of data from multiple sources, thereby providing a much needed spatial analysis of historical events of mass atrocities (Beorn et al. 2009; Madden and Ross 2009; Burlinson and Giordano 2015). Giordano and Cole (2011) for example employ historical GIS, spatial analytical techniques, and social network analysis to provide a deeper understanding of the spatial aspects of the Holocaust. On the other hand, recent research on the theory, method, and practice of fractional data sets—of both historical and contemporary case studies—vividly illustrates the applicability of emergent technologies policy intervention in the understanding and prosecution of mass atrocities (Madden and Ross 2009).

This paper considers the possibilities and limitations of utilizing historical-based data sources. Specifically, we detail the opportunities and limitations of a database derived from records compiled at a security-center (S-21) in operation during the Cambodian genocide (1975–1979). Our intent is to highlight both the challenges and benefits of analyzing a new and heterogeneous dataset in the context of genocide, thus contributing both to the epistemological issues associated with the rigorous analysis of inchoate data sources and also to our concrete knowledge of atrocities associated with Cambodia. Our paper unfolds in four sections. First, we situate our study within the broader theoretical discussion of ‘Big Data’ or emerging large datasets and its implication for genocide studies. Second, an overview of the Cambodian genocide and its corresponding security apparatus is presented. Third, we identify the multiple challenges confronting those conducting research on the Cambodian genocide, namely the fundamental

contradiction wherein on the one hand a surfeit of materials exist but, on the other hand, these materials remain uneven and woefully lacking in geo-references. Fourth, we present procedures adopted and findings derived for our case study. In particular, we draw attention to the interactions of time and space in the arrest, detainment, and execution of prisoners. Overall conclusions and future directions are provided in the final section.

## Genocide and the epistemology of Big Data

Researchers across the disciplines are increasingly using geospatial technologies as both quantitative and qualitative means of documenting, analyzing, and representing the location and timing of arrests, concentration and labor camp construction, executions, and other atrocities associated with mass violence and genocide (Knowles et al. 2014; Burlinson and Giordano 2015; Knowles et al. 2015).

Archived documents pertaining to mass violence and genocide are by nature heterogeneous and (frequently) contain massive amounts of information, including aggregate lists of arrests, detainment, torture, and execution; individual, biographical records on those arrested and/or executed; geospatial information, such as places of arrest, mass graves, prisons; photographs of detainees; and transcripts of confessions. Consequently, historians and other scholars working on genocide and mass violence encounter many problems—but also opportunities—identified by those scholars working in the field of ‘big data’.

An exceptionally malleable term, big data refers in general to data sets that are huge in volume; high in velocity; diversity in variety; exhaustive in scope; fine-grained in resolution; relational in nature; and flexible (Kitchen 2013, 262). As this list of traits indicates, big data as a concept is in danger of becoming so inclusive as to be meaningless. Indeed, Kitchen and McArdle (2016, 9) conclude that the term is increasingly used as a catch-all, amorphous phrase and that Big Data as an analytical category needs to be unpacked. This is an important observation, for it relates specifically to the conduct of research and production of knowledge of historical (and contemporary) events of atrocity and violence.

As detailed in the following section, scholars working on the Cambodian genocide are now

confronted with a voluminous amount of data previously not accessible. The establishment in 1995 of the Documentation Center of Cambodia (DC-CAM) in particular marked a watershed in the historiography of the Cambodian genocide. Located in Phnom Penh, DC-CAM is the principle archive of documentary materials related to the Cambodian genocide and includes two main types of documents: primary documents (i.e., those produced during the genocidal years) and secondary documents (i.e., those produced after 1979, including interviews with both Khmer Rouge members and survivors of the genocide). Overall, the archives at DC-CAM include approximately one million pages of documents from the Khmer Rouge period, including meeting minutes, reports, party periodicals, and files from the Khmer Rouge secret police (the *Santeab*); in addition, the archives include documentation of over 20,000 mass grave sites, 196 prisons, 60,000 photos from the Khmer Rouge period, 260 documentary films shot during and directly after the genocide period, and approximately 50,000 interviews conducted by DC-CAM staff with perpetrators and survivors (Tyner 2008).

The surfeit of emerging materials at DC-CAM affords considerable opportunities for both fine-scaled and aggregate studies. However, it should be noted that the initial compilation of most documents by the Khmer Rouge constituted—at the time—real-world data. In other words, it is possible to apply many of the same epistemological discussions currently underway to those materials archived at DC-CAM. For example, Frické (2015) cautions that having more data does not easily translate into the assessment that we know more. Archived materials in this case “are not in themselves offering any explanations or theories”; rather, the “provide lists, catalogs, and classifications” (Frické 2015, 652). We should therefore not rush headlong into the archives in giddy and naïve anticipation that ‘truth’ will somehow materialize. Miller and Goodchild (2015, 450), to this end, question: “Are theory and explanation archaic when we can measure and describe so much, so quickly?”

The risk is that scholars may succumb to the siren’s song of plentiful data—such as that archived at DC-CAM—and lose sight of the mundane, bureaucratic procedures that initially generated the information. In other words, there is a danger that emerging and voluminous data sets may unduly drive the scholarly agenda and that the overall context of how (and where)

data were compiled are neglected. Indeed, Graham et al. (2015) note that “information has always had geography. It is from somewhere; about somewhere; it evolves and is transformed somewhere; it is mediated by networks, infrastructures, and technologies: all of which exist in physical, material places.” In this paper we consider the voluminous records of prisoner arrests and executions associated with the Cambodian genocide. This ‘data’ we maintain provides an invaluable glimpse into the day-to-day machinations of a genocidal regime. However, the analysis of these records must be firmly grounded in the specific nature of how those records were compiled and collated; and that scholars should not engage in data-mining procedures, for example, devoid of a grounded contextual understanding of the broader political-economy in which the records were generated. As detailed below, for example, the records associated with S-21 are incomplete and problematic; moreover, given the unique status of S-21 within the overall security apparatus of the Khmer Rouge, it is not possible to generalize findings of this one center to the totality of the genocide—a common failing in many accounts of both S-21 and the Cambodian genocide (cf. Clegg et al. 2012).

### Security under the Khmer Rouge

The Communist Party of Kampuchea (CPK; also known as the Khmer Rouge) constitutes one of the most violent political movements of the twentieth-century. Between 1975 and 1979 the Khmer Rouge carried out a program of mass violence that led to the death of approximately one-quarter of Cambodia’s pre-war population. In less than 4 years upwards of two million people died of torture, murder, starvation, disease, and exhaustion.

After 5 years of civil war (1970–1975), the Khmer Rouge entered Phnom Penh, the capital of Cambodia and assumed power. Their victory, on April 17, 1975, had been anything but certain. The Khmer Rouge constituted neither a centralized, efficient political party nor military force. Their victory was the haphazard by-product of the culmination of a series of events, including anti-colonial and anti-monarchical social movements, the anarchy of war, and the sustained illegal bombing of Cambodia by the United States (Kiernan 1985). The Khmer Rouge ‘achieved’ victory not because they were united in principle and

in ideology with the Khmer populace; in fact, the revolution enacted by the CPK was not the end-result of a popular uprising but rather the result of a repressive cadre of individuals that brutally outmaneuvered both their political opponents and allies.

As part of its overall goal of achieving autonomy and self-mastery, the CPK premised that success depended on agricultural productivity. As explained in its ‘Four-Year Plan’, developed between July 21 and August 2, 1976, the CPK identified two economic objectives. The first was to improve the people’s living standards. This was to be accomplished through the satisfaction of a second objective, specifically to increase capital from agriculture in an effort to develop industry (Chandler 1991; Tyner 2014).

To meet these objectives, CPK leadership determined that not only did the amount of land under rice cultivation need to expand but that overall rice *productivity* had to be tripled, to a national average yield of three tons per hectare per year. These increases in productivity were to be accomplished through (1) improvements in efficiency realized through the use of mechanical tools, chemical inputs, and scientifically bred seeds; and (2) the construction of large-scale irrigation works that could supply water to rice fields during the dry months of the year. As to the former, tools and chemical inputs were to be either manufactured within Democratic Kampuchea or purchased from abroad using revenues from the sale of surplus rice. Improved varieties of seeds—some developed within the country with foreign assistance, others imported directly—were to be widely disseminated to agricultural collectives. As to the later, the CPK launched massive work projects to construct a network of dikes, canals, and reservoir (Tyner 2014; Tyner and Rice 2015, 2016).

The expansion of lands devoted to rice production, the enlargement of irrigation schemes, and a broader effort to overcome problems of input supply, output, and transportation all constitute efforts to generate absolute surpluses. However, to these material practices, the CPK added a particularly exploitative practice that was, in effect, a means of attaining relative surpluses. This required the imposition of a draconian system of food rations that led to severe conditions of malnutrition and famine-related deaths (DeFalco 2011; Tyner 2014; Tyner and Rice 2015, 2016).

The fragility of CPK rule, coupled with an exceptionally fragile economy, contributed in part to the development of a massive security apparatus designed to seek out and ‘smash’ perceived external and internal enemies. The CPK administered the country via a hierarchical arrangement of nested geographic Zones, e.g., the Northeast, North, Northwest, Southwest, so on. ‘Special’ Zones were also created; these included the area around Phnom Penh and other key sites, such as the area surrounding the city of Kratie (i.e. Region 505). Zones were sub-divided into regions, districts, co-operatives, and villages. This spatial organization was pivotal for its administrative practices—including those of security (Tyner and Devadoss 2014). A network of approximately 200 security-centers was established both in Phnom Penh and throughout all of Democratic Kampuchea (Chandler 1999; Ea 2005). Conforming to the socio-spatial organization of the country, these security-centers were established hierarchically: Each Zone was to maintain a ‘Zone-level’ security-center; each District a ‘District-level’ security-center; and so on.

It was the combination of agricultural co-operatives, forced labor camps, and infrastructure projects that primarily determined the location of security-centers. Thus, for example, the distribution of co-operative level security centers was dictated by the distribution of agricultural co-operatives. Detainees at these security-centers were often accused of ‘minor’ crimes, such as idleness or the failure to exhibit proper attitudes. Significantly, these low-level security-centers were premised on reform and rehabilitation; detainees were often—though not always—reintegrated into society.

Higher-level security-centers served in part as ‘collection’ points for persons accused of more serious crimes. These offenses might include theft or ‘immoral’ sexual relations. Interrogations and executions might also take place at these locations. These centers were often more permanent in structure and located in or near larger towns and cities. In Kompong Thom Province, for example, Wat Baray Choan Dek was converted into a large security center. Upwards of 40,000 people are believed to have been killed at this site and buried in adjacent mass graves.

As a security-center S-21 was unique,<sup>1</sup> Phnom Penh was administered separate from other zones; this

<sup>1</sup> The ‘S’ designated *sala*, or hall, while the ‘21’ was the code number for this particular center.

imparted a different chain of command that would inform the decision-making associated with policies and practices in the capital city—including those at S-21. Also, S-21 was established as both a political and military compound (OCIJ 2010, 109); accordingly, the purpose of S-21 was not to reform or rehabilitate; its purpose was specifically to document and punish perceived criminal offenses against the state. In other words, S-21 was administratively a state-level security-center designed to punish principally those who committed offenses *against the state*. Significantly, most of the prisoners at S-21—over 80 %—were former Khmer Rouge cadres and soldiers accused of betraying the revolution. Indeed, the most prominent group of detainees was that of Khmer Rouge soldiers who were purged from the military; the second largest group was composed of CPK cadre, including many zone secretaries and members of the Standing Committee of the CPK.

The arrest and execution practices merit close addition. Within Democratic Kampuchea, members of the highest echelons of the CPK viewed with suspicion all members of society. According to Chandler (1999, 41), top officials, such as Pol Pot, thought that enemies were everywhere; consequently, it was necessary to remain vigilant in the pursuit, capture, detainment, and execution of those suspected of counter-revolutionary tendencies. Indeed, in a speech delivered in 1977 Pol Pot warned that upwards of 2 % of the country's population belonged to “various spy networks working for the imperialists” as well as other “international reactionaries.”<sup>2</sup> This amounted to approximately 140,000 people out of an estimated seven million total population.

Suspected ‘enemies’ (i.e. those accused of crimes) were arrested by members of the *santebal* (security force)<sup>3</sup> and transported to S-21. There, they were documented, photographed, and imprisoned. Many—but not all—prisoners endured torture sessions and forced to provide lengthy confessions detailing not only the nature of their ‘crimes’ but also ‘strings’ of associates and other ‘enemies’. In turn, these ‘named’ individuals would be arrested and detained. The maximum capacity of S-21 was approximately 1500 prisoners (Chandler 1999, 35).

The Khmer Rouge exhibited a form of ‘disproportionate revenge’ whereby entire families and other social

networks were targeted. For example, if the chief of a transportation unit was arrested, so too would his family and members of the work-unit also be arrested. However, while the chief was likely to endure a longer detainment period—the time between date of arrest and date of execution—his family members, and perhaps most of the other cadre from the work-unit—were held for shorter periods of time before their eventual execution. Typically, these individuals, especially spouses and children, were not forced to write confessions.

Although an indeterminate number of prisoners died at S-21, by far the vast majority were transported to Choeng Ek for execution. Located approximately 15 km southwest of the capital, Choeng Ek was a Chinese cemetery that was converted to a place of execution and mass burial.<sup>4</sup> According to Chandler (1999, 140), the number of executions for any given day ranged from a few dozen to over three hundred; this latter figure, however, is perhaps considerably greater, as we detail below.

It is important to stress that neither S-21 nor Choeng Ek functioned in the same way as Nazi extermination camps. The objective of the Khmer Rouge was not so much the wholesale elimination of a particular ‘race’ or even ‘class’; rather, it was to document and purge suspected enemies. Consequently, there was (from the CPK’s perspective) a rationale to the systematic arrests and executions. And it was this rationale that accounts for the observed patterns of arrests and executions.

### Prisoner data from S-21

In operational terms, S-21 was composed of three main units: interrogation, documentation, and defense.<sup>5</sup> For present purposes, the documentation unit merits special attention. This unit was responsible

<sup>4</sup> According to Chandler (1999, 139) the Khmer Rouge began using the site at Choeng Ek in 1977. Prior to this time, executions took place and corpses were buried in the surrounding area of S-21.

<sup>5</sup> The Defense Unit included two sub-units; the ‘Guard Unit’ was responsible for guarding the prisoners within the security-center and for overall defense of the compound; the aforementioned ‘Special Unit’ was tasked with making arrests, transferring prisoners, and carrying out executions. The Interrogation Unit consisted of at least eleven six-person interrogation groups which, over time, evolved into ten six-person units which were further divided into three-person teams; each team included a chief, an annotator-deputy, and a guard. For an extended discussion, see Chandler (1999).

<sup>2</sup> Quoted in Chandler (1999, 42).

<sup>3</sup> *Santebal* is a compound word that combines the Khmer words *santisuk* (security) and *nokorbal* (police).

for transcribing tape-recorded confessions, typing handwritten notes, preparing summaries of confessions, and maintaining S-21's voluminous files (Chandler 1999).

In many respects, the documentation unit was engaged in the compilation of 'big data'. Upon arrival at S-21 detainees were registered (e.g. in real-time) by members of the Documentation Unit; biographical information was obtained and a summary was prepared, placed in a file of the prisoner. Information included name, sex, position/occupation, place/date of arrest and (ultimately) date of execution. This information was not for 'public' use but rather was kept in private as a form of state surveillance. Next, detainees were photographed; these photos in principle were to be affixed to the prisoners' biographical information.<sup>6</sup> In short, the procedures adopted by the Khmer Rouge followed those of established police procedures, specifically the *bertillonage* system. Developed in the late nineteenth century by Alphonse Bertillon, a French police clerk, this system entailed four components: meticulously documented anthropometric measurements of facial and bodily features using standardized measurements and instruments (e.g. calipers); a 'verbal portrait' that described surface features, such as moles, scars, and tattoos; standardized photographs, i.e. 'mug-shots'; and an elaborate filing system in which complete measurement cards could be systematically divided, filed, and retrieved (Caswell 2014, 35).<sup>7</sup>

Throughout its brief existence, S-21 generated and archived a huge amount of 'data' on detainees. Along with the aforementioned prisoner biographies and mug-shots, many detainees underwent torture as a means of extracting confessions; in turn, these confessions type-written and 'corrected' for errors.

<sup>6</sup> Upon discovery, the archives at Tuol Sleng were in considerable disarray. Many biographical records of prisoners, for example, did not have matching photographs; likewise, many photographs have no corresponding biographers. It is not known for certain if this mis-match is the result of poor documentation; poor archiving by S-21 staff; poor archiving by subsequent individuals; or simply because some people were photographed without biographical information being obtained, and vice versa. No doubt a combination of factors is at play, although the implications are significant.

<sup>7</sup> Caswell (2014) notes that the Bertillon system was introduced in Cambodia by French colonialists. Evidence strongly indicates that this system was adopted, at least in part, by the Khmer Rouge at S-21 and possibly other prisons.

Upon completion, confessions would subsequently be used to identify other suspected persons who would, in turn be arrested, detained, and tortured.<sup>8</sup>

The exact number of prisons arrested and detained at S-21 remains unclear. It is commonly claimed, for example, that approximately 14,000 men, women, and children were detained, with only seven known survivors (cf. Chandler 1999).<sup>9</sup> Recent archival work has however called into question these iconic numbers. The problematic nature of the data is based both on the partiality of records and the disparate forms of recording. Data on prisoner arrests at S-21 are derived from three main sources. First, the Khmer Rouge maintained records of arrests. Second, data are derived from confessions obtained from detainees. The Tuol Sleng Genocide Museum archives contain 4186 handwritten and typed confessions while the archives at DC-CAM contain 833 confessions (Keo and Yin 2011). Lastly, data are obtained from 'execution logs' maintained by the Khmer Rouge. Archived at the Tuol Sleng Genocide Museum, there are 9805 surviving records of executions. Researchers affiliated with the Extraordinary Chambers of the Courts of Cambodia (ECCC) have in the course of their criminal investigation of Kaing Guek Eav (alias Duch), the former head of S-21, concluded that 12,273 prisoners were detained (OCIJ 2010; Keo and Yin 2011). This 'official' ECCC list is derived from a synthesis of the aforementioned arrest records, execution records, and confessions, in that staff members attempted to cross-check names and dates between the three sources.

The compilation of a comprehensive list of detainees is problematic enough; more challenging is the analysis of these records. On the one hand, many records are woefully incomplete. Although administrative staff members at S-21 were required to compile precise information including, for example, name, age, sex, occupation, date and place of arrest, and date of execution, many records include only partial information. Entries may for example indicate name

<sup>8</sup> Many hundreds of confessions are archived at the Documentation Center of Cambodia and the Tuol Sleng Museum of Genocide. Transcripts of these confessions range from only a few pages to more than one hundred pages; very few have been translated into English, and even fewer have been digitized.

<sup>9</sup> Staff at DC-CAM estimate that at least 179 prisoners were released between 1975 and 1978 (Keo and Yin 2011).

and sex but reveal no information on occupation. Equally problematic are discrepancies of individual records. By way of illustration, some records indicate that an individual was arrested, say, on June 10, 1976 but scheduled for execution on April 6, 1976. For records of this sort, there are many possible explanations, including typographical errors or the ‘merging’ of prisoner records of two (or more) individuals to a single individual. Compilation problems are further compounded because many men and women associated with the Khmer Rouge used aliases; it is not uncommon for example that entries for arrests will include multiple references to the same name. Considerable cross-checking between the various data sets is therefore required to eliminate the possibility of double-counting of individuals.

We initially utilized the ECCC’s comprehensive list of 12,273; however, cleaning of the data was required. For more fine-grained analysis, therefore, we first excluded those records with missing values (i.e. no information on sex, date of arrest, or date of execution). This reduced the data set to 8332 ‘usable’ observations. An additional 49 records were eliminated because of clearly incorrect information (e.g., the aforementioned discrepancy between date of arrest and date of execution). The *effective* size for analysis thus included 8283 records out of the total 12,273. Stated differently, we are able to empirically analyze the sequence of detainment and execution of 8283 men, women and children at the S-21 security-center. However, for additional disaggregated analyses, incomplete records further limited the number of observations. For example, the sex of any detainee was specified for only 5501 detainees (3825 men and 1676 women). Of these, matching sets of dates of arrest and execution were available for only 1228 men and 1110 women. This poses immediate problems, in that these small numbers are of questionable statistical value.<sup>10</sup>

<sup>10</sup> A reviewer of an earlier draft of this manuscript correctly noted that for statistical purposes, the ‘sample size’ is not acceptable. However, we caution that these figures do not constitute samples but rather the population of usable records. This reviewer also correctly notes that the records are non-random; this is accurate. We are confronted with an incomplete population, not a sample, based on Khmer Rouge practice. We can make valid descriptive conclusions on the total number of men and women, for example, whose records are complete; we are not able to ‘generalize’ from these to the total number of 12,273 detainees at S-21. This is a crucial observation, in that

Nevertheless, as scholars working with historical data sets, this constitutes the available record. While definitive conclusions are not therefore possible, these numbers provide—at the moment—the only opportunity to disaggregate arrests and executions over time and space.

### Modeling of detainment and execution

An initial guiding question was to provide an understanding of the duration of detainment: How long were prisoners detained from the date of arrest to the date of execution? To address this question, a variable was created (termed ‘days’) by subtracting the ‘Date of Entry’ from the ‘Date of Execution’. This represents the number of days a person was detained between arrest and execution. A second variable ‘frequency’ was obtained by counting the number of records with the same value in ‘days’. This indicates how many people were kept for the same duration between arrest and execution.

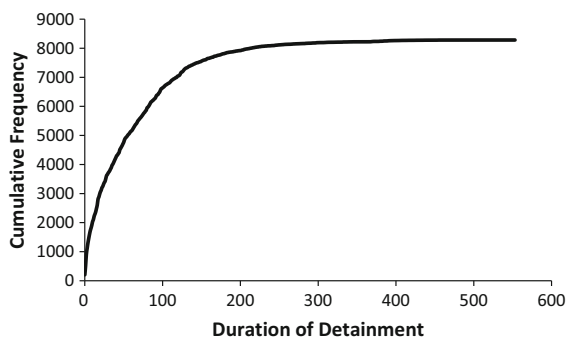
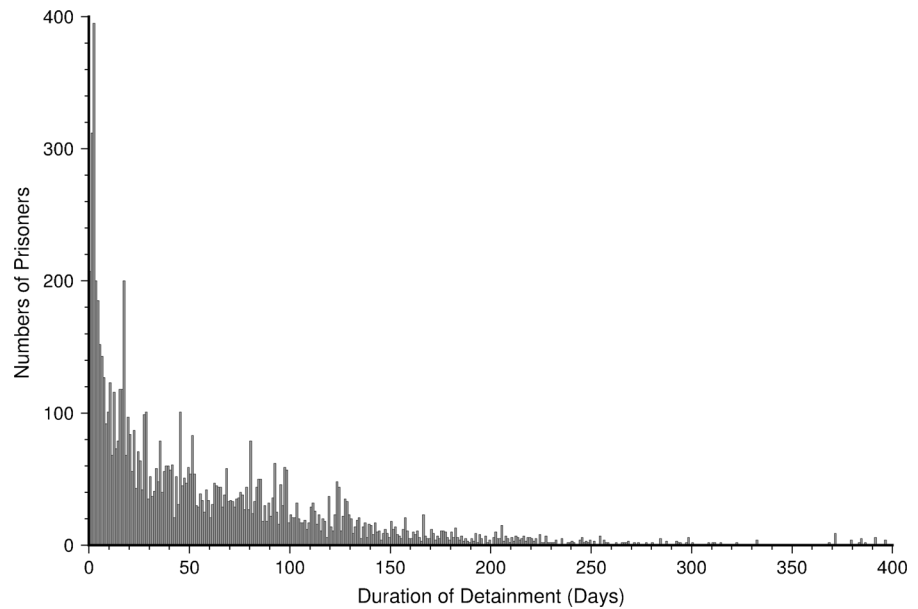
For all prisoners for which a complete record is identified, the mean duration of detention was 180 days. The ‘average’ stay of internment, however, belies significant variability. Figure 1 illustrates the frequency of duration. For example, of the 8283 observations, 206 people were arrested and executed on the same day; 312 were executed within 1 day of arrest; and 395 were executed within 2 days of arrest. Figure 2 illustrates the cumulative frequency of arrest and execution. Thus, of those individuals for whom a paired date of arrest and execution is available, 518 men, women, and children were executed within 1 day of arrest; 1720 detainees were executed within 1 week of arrest; 3707 were executed within 1 month of arrest; and 5156 were executed within 2 months. In other words, of all complete records for which date of arrest and execution are known, over 80 % of detainees were executed within 2 months of arrest.

To what extent does this temporal pattern remain constant throughout the existence of S-21? Table 1 illustrates that for the period 1976–1978, the interval between initial detainment and execution shortened considerably. Of the 8241 individuals for whom

Footnote 10 continued

scholar’s unaccustomed to statistical analyses may erroneously generalize from the inchoate data set provided by the ECCC.

**Fig. 1** The duration of detainment between date of arrest and date of execution;  $n = 8283$



**Fig. 2** Cumulative distribution of duration of detainment between date of arrest and date of execution, 1975–1979;  $n = 8283$

complete records are available, nearly 63 % were executed within 2 months of arrest. However, disaggregation by year indicates that the duration of detainment decreased appreciably. Stated differently, as the regime continued, the rapidity in which prisoners were executed increased significantly. By 1978, two-thirds of prisoners were executed within 1 month of arrest; over 90 % were executed within 2 months. Figure 3 illustrates an even greater complexity to this pattern. In May 1975 for example the mean length of detainment (for those men and women arrested in May) was 25 days; however, by October of that year the length of detainment peaked at 40 days. Afterwards, the mean period of detainment fluctuated,

although the overall trend is one of shorter detainment prior to execution. Figure 4 is also notable in that it reflects 3 months of exceptionally short detainment periods: June 1976, June 1977, and December 1978. These months correspond with the broad periods of purges identified by Chandler (1999).<sup>11</sup>

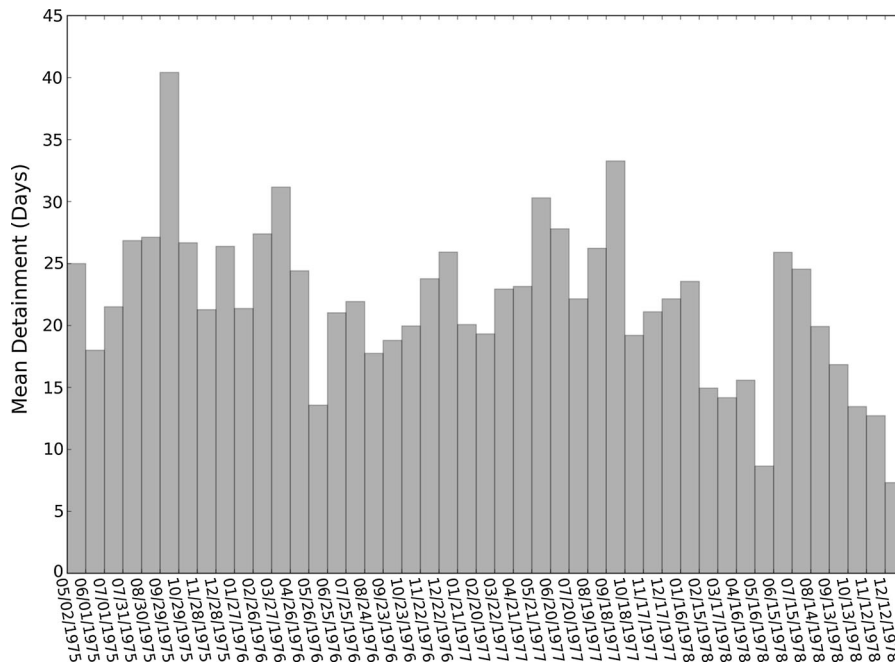
There is a distinctive spatiality to these trends; however, the existing data set is frustratingly incomplete in terms of georeferenced data. Spatial analyses are therefore limited by a paucity of data and, consequently, small sample sizes. Moreover, Khmer Rouge records are often incomplete vis-à-vis geographic specificity. It is not uncommon, for example, for records to be lacking information related to place of arrest. Furthermore, when information is provided, it is often indeterminate. Indeed, many records indicate the place of arrest not in geographic terms (e.g. commune, region, district, or zone) but rather the unit to which the individual was assigned (e.g. motor-pool division or division 505). For this analysis, through archival research, we were able to identify the geographic location of 3476 individuals for whom we also could match dates of arrest with dates of execution.

<sup>11</sup> In his analysis, Chandler calls attention to broad periods of purges, e.g. September 1975 through September 1976. Our analysis does not dispute Chandler's claims, but instead provides a greater level of detail.



**Table 1** Cumulative duration of detainment of prisoners arrested by year

Year	Executed within		
	One week (%)	One month (%)	Two months (%)
1976 (n = 1422)	16	35.3	50
1977 (n = 4434)	18.6	36.5	50.7
1978 (n = 2385)	27.9	66.5	92.1
Total (n = 8241)	20.9	45	62.6



**Fig. 3** Mean length of detention by month, 1975–1979; n = 8289

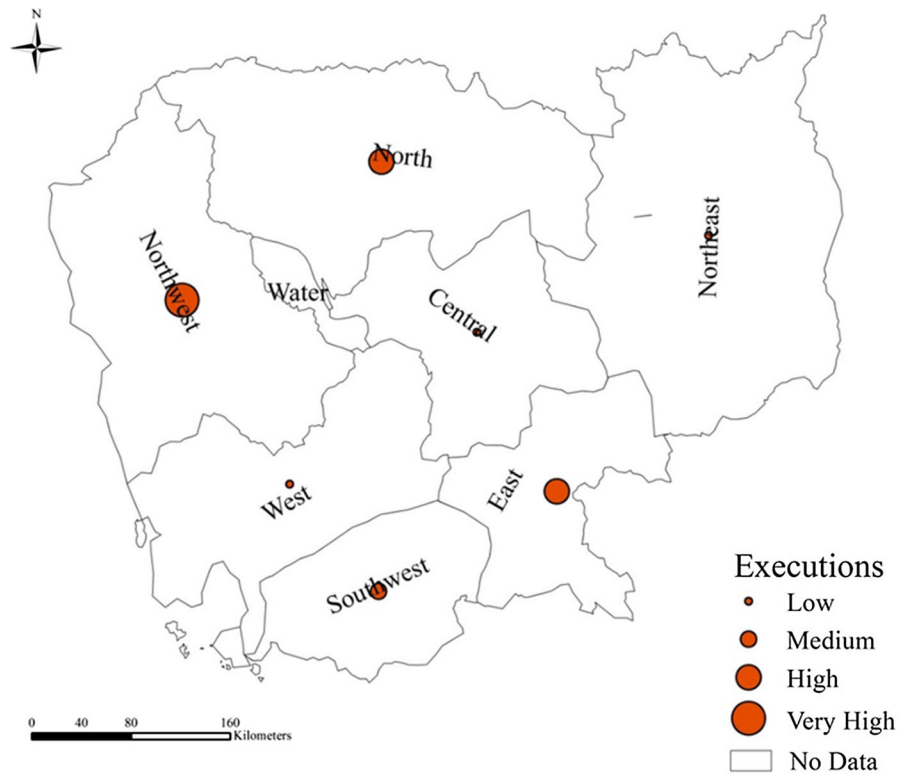
Figure 4 provides an initial—and limited—geographic view of the arrests. Notably, a very high number of executed prisoners were arrested from the Northwest Zone and that high numbers were arrested also from the North and East Zones. This is consistent with findings provided by Chandler (1999) and documents the selective targeting of CPK officials. The number of executed prisoners from the Northeast, West, and Central are relatively fewer in number. Caution however is required, given the incompleteness of the geographic record.

Table 2 presents a strong spatial variability of imprisonment. Those men and women arrested from the East and Southwest Zones, for example, were executed within a relatively shorter amount of time than those men and women from other zones. Sex differences by administrative zone are illustrated in Tables 3

and 4. In general, for all regions, women were executed following shorter periods of imprisonment than their male counter-parts. Of those arrested in the North Zone, for example, over 76 % of female prisoners were executed within 2 weeks of arrest; conversely, only 48 % of male prisoners from this same region were executed within 2 weeks of arrest. Conclusions however must be tempered by the small numbers.

**Conclusions**

Between 1975 and 1979 Cambodia experienced a period of mass violence that resulted in the death of approximately two million men, women, and children. Many of these fatalities resulted from starvation, exhaustion, and disease. However, an untold number

**Fig. 4** Spatial distribution of executed prisoners**Table 2** Cumulative duration of detainment of prisoners by zone

Zone	Executed within		
	One week (%)	One month (%)	Two months (%)
Central (n = 110)	0	16.4	25.5
East (n = 881)	34.5	69	92.1
North (n = 699)	27.5	50.6	64.4
Northeast (n = 52)	9.6	36.5	65.4
Northwest (n = 1214)	16	40.8	62.9
Southwest (n = 260)	38.8	52.7	65.4
West (n = 260)	0	16.3	25.6

**Table 3** Cumulative duration of detainment of male prisoners by zone

Zone	Executed within		
	One week (%)	One month (%)	Two months (%)
Central (n = 26)	0	3.8	19.2
East (n = 50)	4	30	52
North (n = 99)	28.3	47.5	57.6
Northeast (n = 13)	0	0	30.8
Northwest (n = 248)	11.7	23	44.4
Southwest (n = 29)	3.4	6.9	17.2
West (n = 14)	0	21.4	28.6

**Table 4** Cumulative duration of detainment of female prisoners by zone

Zone	Executed within		
	One week (%)	One month (%)	Two months (%)
Central (n = 1)	0	0	0
East (n = 134)	56.7	87.3	97.8
North (n = 64)	31.3	76.6	81.3
Northeast (n = 7)	28.6	57.1	85.7
Northwest (n = 7)	28.6	57.1	85.7
Southwest (n = 15)	40	46.7	53.3
West (n = 4)	0	0	25

were executed at numerous security-centers located throughout the country. Among these, the security-center designated ‘S-21’ is remarkable not so much because of the number of individuals detained and arrested, but rather because of the *relatively* complete records of arrests and executions. That being said, information on those arrested and executed is partial at best; documentation is complete and those archives that are available are beset with numerous omissions and errors. This poses a paradox for scholars, in that the records available provide tantalizing yet fragmented clues as to the processes of arrest and execution by the Khmer Rouge. Indeed, prisoner data from S-21 constitute a fractional data source and thus requires considerable care when used for spatial and temporal analysis.

This paper provides a first tentative step towards a more thorough *empirically* informed, space–time analysis of S-21. In our discussion we identify sources of information and the limitations of these sources; we identify also the difficulties of operationalizing prisoner data from S-21. Findings must be treated carefully; disaggregation of the records, whether by geographic location, time period, or sex preclude definitive generalizations but is suggestive of calculated decisions and practices among the Khmer Rouge leadership, thereby necessitating follow up analysis. Overall, male prisoners were arrested earlier during the genocide, and in greater numbers, than female prisoners; this holds across administrative zones of Democratic Kampuchea. Furthermore, female prisoners were detained for appreciably shorter periods of time between date of arrest and date of execution. This indicates a number of possibilities, including that male prisoners arrested were considered more ‘valuable’ from the standpoint of having information to be extracted through torture and forced confession. This is consistent with previous research that highlights,

first, the prevalence of men holding more senior positions (Chandler 1999). This is also consistent with the observation that the Khmer Rouge frequently arrested and executed spouses and other relatives of targeted persons, a practice known as ‘disproportionate revenge’. If for example a district secretary is arrested, so too will his wife and children be arrested. However, while the Khmer Rouge may detain the official for a matter of months—thereby subjecting him to torture—his wife and children may be executed in a matter of weeks, or possibly months.<sup>12</sup>

Over time, the interval between date of arrest and date of execution, irrespective of geographic location and sex, shortened. In other words, those men and women arrested during the early years of the Khmer Rouge regime were detained longer than those arrested during the latter years. This suggests that as the regime began to collapse in 1977 but especially throughout 1978 the necessity of obtaining forced confessions was overshadowed by a greater impetus to simply execute ever growing numbers of men, women, and children. This conforms also to previous scholarship which details a deepening paranoia among the Khmer Rouge leadership. To this end, massive purges took place, whereby entire units and/or geographic locations were targeted for elimination. It is this practice of selective arrest and execution which accounts for the ‘pulses’ of purges identified in the historical record. Additional analysis is required to correlate the clustering of arrests and executions with the demographics of those targeted.

In conclusion, this paper calls attention to the necessity—but also the limitations—of the historical

<sup>12</sup> At this point it is not possible to disaggregate the records based on ‘position’ (e.g. soldier, official, or spouse), as the numbers for any given category would be too small for analysis.

and geographical reconstruction of patterns of mass violence. Additional work is necessary to not only further refine and complete the list of arrests and executions but also to begin the laborious task of matching key policy decisions of the Khmer Rouge with observed patterns of arrests and executions. Such work will greatly inform not only our scholarly understanding of the Cambodian genocide but also provide a foundation both for additional legal efforts to bring about social justice and efforts to promote truth and reconciliation in the country.

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