

WOUNDED PERSONS RELATED TO THE SIEGE OF MOSTAR: A STATISTICAL ANALYSIS OF THE MOSTAR WAR HOSPITAL BOOKS

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1. BACKGROUND

This report summarizes the results of a statistical analysis of wounded persons related to violent incidents that occurred during the siege of East Mostar from May 1993 to April 1994. The analysis was requested from the Demographic Unit of the Office of the Prosecutor by the Prosecution Team preparing the case of JADRANKO PRLIĆ ET AL. (case number: IT-04-74), and had the goal of producing an expert report on the wounded persons. In particular, the Bosniak victims were the target for our analysis.

The report focuses on the wounded persons from the area of East Mostar. The area is much smaller than the pre-war municipality of Mostar. East Mostar was located on the east side of Neretva river, including a narrow strip of buildings on the west bank, where the most Bosnian Muslims moved to in result of the HVO actions against Non-Croats on 9-10 May 1993. The Muslim enclave in East Mostar was separated from the rest of the town by the HVO-ABH confrontation line running north and south along the Bulevar and Šantićeva Street, to the west of the Neretva river. The enclave was surrounded by the Croat forces at the north and south, with Bosnian Serb forces to the east.

Sources that contain information about the wounded population from East Mostar are extremely seldom. Occasional press reports, reports by international observers of the Herceg-Bosna conflict, statements of eyewitnesses are examples of these sources. There were no systematic surveys of wounded persons from this territory. One source that could be used for this type of analysis were hospital records. Basically two hospitals operated during the siege in Mostar: one in West Mostar (controlled by the Croat forces) and one in East Mostar (controlled by the Bosnian government forces, i.e. by Bosniaks). The latter source exists in the form of the Mostar War Hospital Books and contains records of mainly Bosniak population wounded and killed during the siege. This report concentrates, therefore, on this single source.

Records from the Mostar War Hospital Books (almost 6,000 entries) include killed and wounded persons from the territory of East Mostar and the period from 9 May 1993 to 25 May 1994, i.e. longer by about 1 month than the formal indictment period (that lasts to April 1994). Records reported after April 1994 are likely related to the siege too as these are cases of wounding from occasional shelling incidents in this period, delayed consequences of injuries acquired during the siege and other siege-related health problems. This is why these records are included in this analysis too. The War Hospital records were collected by the Prosecution team and copies of five original War Hospital Protocol Books are available from the Evidence Unit.

In order to distinguish between civilians and soldiers¹, for this report I also used the Military Records of Soldiers and other Military Personnel Killed during the Bosnian War. These lists cover completely all three armies (ABH, HVO and VRS) and the entire war period (April 1992 to December 1995), and were provided to the OTP by the (FBH and RS) Ministries of Defence. The total number of records in the three lists is about 48,500 (about 28,000 from ABH, 14,000 from VRS, and 6,500 from HVO). Also these lists are available from the Evidence Unit.

This report comprises an Executive Summary and the following sections:

1. Background
2. Mostar War Hospital Books: The Original Source
3. Data Cleaning and Establishing the Mostar War Hospital Database
4. Assessment of Deficiencies of the War Hospital Records and Minimum Numbers of Victims
5. Age, Sex and Timing Patterns of Patients Marked and Not Marked as Wounded
6. Final Results

The Herceg-Bosna conflict is understood in this report as the facts and events referred to in the Indictment of the case IT-04-74, that occurred on the territory of eight Herceg-Bosna municipalities (Čapljina, Gornj Vakuf, Jablanica, Ljubuški, Mostar, Prozor, Stolac, and Vareš) in the time period from November 1991 to (around) April 1994). The siege of Mostar is an episode of the conflict in Herceg-Bosna that took place in the town of Mostar and its surroundings between 9 May 1993 and 12 April 1994, when an agreement was signed by the Herceg-Bosna/HVO representatives and the Muslim side in Split, Croatia.

2. MOSTAR WAR HOSPITAL BOOKS: THE ORIGINAL SOURCE

Information about establishing and character of the Mostar War Hospital (hereafter: WH) is available from the witness statement of Jovan Rajkov, a physician that worked in the hospital during the siege (ERN 0200-0448-0200-0459). Rajkov joined the BH Army in August 1992 and was with the WH (first as a general practitioner, later as a surgeon) since its creation until several years after the end of the siege.

- The Mostar War Hospital was located at the Titova-street on the right bank of Neretva river and during the siege of Mostar functioned (mainly, but not exclusively) as the war hospital for the Bosnian Army; thus, it was a military hospital;
- As a military facility the WH had a limited access to humanitarian aid; therefore, the status of WH was changed in December 1993 from military to just a hospital;
- Disregarding its status, all kinds of patients were treated in the hospital at all times; according to Rajkov, approximately 50% of the patients were civilians (mainly Muslims); occasionally, a few prisoners of war (mainly Croats) were treated here as well;
- During the siege the main hospital of Mostar, i.e. the Regional Medical Centre of Mostar, located on the West bank of the Neretva river controlled by the HVO forces,

¹ The term “soldier” is used interchangeably with “military”. It covers members of the army, police, other military forces of the Ministry of Defence, and supporting military personnel. In the context of records from the Mostar War Hospital Books it can relate to armed individuals that were not necessarily formally affiliated with the army or other military forces.

functioned as the War Hospital for the HVO; this situation continued already since the spring of 1992;

- The creation of the ABH War Hospital was obviously a necessity as the (mainly) Muslim population from East Mostar had practically no access to the Regional Medical Centre of Mostar;
- The WH was created about one month before the siege started (i.e. around early April 1993) by a group of physicians (including Rajkov) in anticipation of possible casualties of the intensifying conflict; they established this facility on their own initiative and no one stopped them from doing so; the physicians received a lot of support from the BH Army and from the local population of Mostar; occasionally they received some help from international organizations;
- The WH was created out of an out-patient clinic established in October 1992 mainly for the needs of the BH Army; the clinic was meant to be used by both the civilian population of Mostar and the BH army, however;
- The WH was a rather small facility; at first there were only seven-eight beds in the Intensive Care Unit and probably only a few more beds in regular patients rooms; in the beginning of the siege only (a part of) the basement was used, later patients were transported to upper floors too;
- The basement remained the major part of the hospital, however; the surgery room, intensive care unit, small pharmacy, reception room and major pieces of equipment were all there; at first, there was no kitchen and no laundry service in the hospital itself; all these services were provided from private houses in the neighbourhood of the hospital; only later a small kitchen was established; washing clothes (and cleaning of the equipment) remained a problem;
- The conditions in and the equipment of the hospital were extremely bad; water was only available from water tanks (three of them were available), water was not tested and not purified with chlorine; there were breaks in electricity supply; an old electricity generator was only used for surgeries; there was not enough fuel for the generator; they did not have enough light and surgeons were using little headlamps during the surgeries; they had shortages of surgical clothes and often operated half-naked (from waist up); surgical equipment was sterilized in an ancient autoclave heated up with fire made of wood; at first they did not even have an X-ray machine; there were shortages of medicines, including anaesthetics and blood testers;
- The hospital was located closely to the confrontation lines and was systematically exposed to the fire of HVO;
- According to Rajkov (ERN: 0200-0455-0200-0455): The Hospital was twice hit by the tank fire. I cannot remember exact time of the shelling but it was not cold. The northern part of the building got two hits. The shells must have come from the direction of ORLOVAC according to our estimation. Once a big piece of shrapnel came through the front door. There was a huge hole on the western and northern side of the building. The roof had many holes. From the mountain HUM HVO could not see the Hospital, but they used a kind of Anti-Aircraft fragmentation ammunition that exploded above the Hospital. Many mortar shells hit the area in front of the surgery room and the path behind the building. There were people who got wounded around and inside the building too.
- At the beginning of the siege the WH staff did not pay attention to keeping patients' records complete and in good order; only later they realised how important it was (e.g. for receiving medicines) to show a register of patients and treatments they received;
- Except of this hospital there were no other hospitals in the area of East Mostar; there existed some other (out-patient) medical facilities in this part of the town, however;

- First aid clinics² included: ŠANTIĆEVA, CERNICA, ŠEMOVAC, MAHALA, and TEKIJA;
- Stationary clinics included the following objects: at the building across the road from hospital, at DUNAV insurance company building, at social care building, at communist party committee building, at BRANKOVAC, and at ZELIK (after Rajkov; ERN: 0200-0456-0200-0456);
- The War Hospital at the TITOVA street was not a single medical facility in the area of East Mostar and many victims from this territory likely contacted other health centres instead of coming to the War Hospital (for convenience and/or with less severe injuries). However, the War Hospital was the only in-patient facility in this area.
- Thus, the population treated in the War Hospital is a sample of all those that suffered injuries or death during the siege. It is difficult to assess how large this sample is, especially with regard to the wounded persons; no reference can be made to alternative statistical sources as such sources do not exist; it is easier to make an assessment for the killed; this will be done in the report on the killed persons.

For use in the assessment of casualties of the siege of Mostar, five original patients' registers of the Mostar War Hospital, the so-called War Hospital Protocol Books (hereafter the WH Books), were collected by OTP investigators in the year 2001. The ERNs of the original material are the following:

- a) 0200-0460-0200-0467: 8 pages, 09.05.1993-10.05.1993
- b) 0109-7072-0109-7198: 127 pages, 09.05.1993-23.06.1993³
- c) 0200-9824-0201-0226: 599 pages, 15.06.1993-18.08.1993
- d) 0200-5409-0200-5610: 203 pages, 18.08.1993-13.10.1993
- e) 0201-0424-0201-0824: 400 pages, 13.10.1993-24.05.1994

Entries in the WH Books are personal records of those who came or were brought to the War Hospital in the order as they were received. Some records may have been entered later than at the moment of arrival due to the work load of the hospital staff. Each entry is a different hospital case, i.e. a person registered under a unique sequential number.⁴ Each hospital case (i.e. each record in the WH Books) contains the following data items⁵:

- Unique sequential number
- Date of arrival at hospital
- Surname
- First name
- Year of birth
- Status (civilian - military)

² The meaning of the word clinic is unclear. It might be that these clinics were health centres not necessarily equipped as regular clinics and not necessarily offering the same services and treatments as the regular clinics usually do.

³ In document b) one part of pages (about a half) is ERNed in ascending order and the remaining pages in descending order. The documents' dates clearly overlap. The overlapping as well as missing pages are discussed later in this report.

⁴ In the WH Database, one duplicate was, however, found on the SerialNumber (2043) and was eliminated. More duplicates were found based on other criteria, i.e. names/initials, YoB, and date of event, and controlling for additional factors, such as type of event. These duplicates were registered in the WH Books under different SerialNumbers and might represent different persons, but according to our criteria they are too similar to be considered different. See Section 3 for more about duplicates.

⁵ In addition to the above items, also sex, age and ethnicity were created by data entry clerks (B/C/S native speakers).

- Military unit
- Location of incident
- Time of incident
- Wound description
- Marker explains the status of the patients, such as P = admission; K = sent home; OP = operation; () = death (in the book it is actually a circle around the number)

The original entries give a total of 5,910 records from all books; they start on 09-May-93 and end on 24-May-94.

3. DATA CLEANING AND ESTABLISHING THE MOSTAR WAR HOSPITAL DATABASE

The War Hospital Database (hereafter the WH database) was established by the Demographic Unit, OTP, of the records reported in the War Hospital Protocol Books. The WH database is organised exactly as reported in the WH Books. As the basic data entry was done by others, i.e. the OTP investigations team, (hereafter: InvT), we - demographers - started our project by controlling the completeness and quality of the computerized data. This was done by studying the original books registered with the EU and comparing records in the database with those on paper. A summary of major findings and improvements is attached below:

- A new item was created, MyDate, which contains info as in DATE (InvT variable). Dates of incidents in MyDate have been checked, corrected if erroneous, and cleaned. Dates stamped in the WH books over two days were taken starting at the first stamped day.
- One new record (skipped in the InvT file) has been entered (MyKey 5911 or SerNo 240/A),
- In the original WH books, pages ERN: 0201-0719 to 0201-0823, some serial numbers of records are incorrect. Records: 3441-3959 should be numbered as: 3491-4009. Thus, 50 records (3441-3490) received already existing serial numbers, but these are not duplicates. In the DU database with war hospital data, two types of reference (or serial) numbers are available: one as in the WH original books, and the second one as mathematically logical (from 3491 to 4009).
- A similar mistake has been found on page ERN 0200-9888. After record (serial number) 183, the next following is 194 in the original books. Thus, records from 184 to 193 have been skipped. These numbers 184-193 are, however, present in the InvT spreadsheet, implying that an additional 10 records are included in the total number of entries from the WH books. The total is artificially inflated. The non-viable records are deleted from the DU database.
- Records (MyKey) 5466 to 5482 (17 records) had Null (i.e. no value) on Date. The date of registration (a proxy for the date of incident) was, however, available from the WH Books (14/04/94). MyDate/Date and MyAge/Age have been completed for these records.
- Records (MyKey) 2, 2103, and 5910 (page ERN: 0201-0823) had no serial number in the InvT spreadsheet. These records are likely to be from 1994, as in the WH book for October 1993 to May 1994 they are mentioned at the very last page (next following after May 1994). MyDate/Date and MyAge/Age have been completed for these records based on 00/00/94.
- Record serial number 3425 has been found empty. In the WH books the space under this number is used for record 3424. Record 3425 has been deleted from the DU database.
- Record serial number 2043 (ERN: 01201-0427, Delalić Aida) is duplicated in the InvT spreadsheet (the serial number 2043 is included two times). The duplicated record is deleted (together with other duplicates) from the DU database.

- 49 records were entered in the InvT spreadsheet with incorrect dates. These records were corrected:
 - record serial no. 728 - correction on month (01 into 07)
 - records 5706-5753 – correction on month (03 into 06).
- Duplicates were dealt with in two ways, I checked duplicates in the original serial number, and secondly duplicated records of persons reported arriving on the same date, and having the same YoB, names, event type etc. Note that if one the same person was reported as wounded several times at different dates, I did not consider this a duplicate, as such cases are perfectly possible.
 - a) Duplicates in serial numbers: 231 records were found to have the same (numeric part of the) serial numbers. Among those 231 records, 3 records had Null on the serial number but persons had different particulars, 10 records were indicated as skipped in the database and Marked for deletion, and 109 pairs (218 records) had the same serial numbers. Of the 109 pairs, only one pair appeared to be the actual duplicate (serial no. 2043). 50 pairs were the records registered in the WH books under repeated serial numbers but the registered individuals were all different. All other pairs, (58), contained names of two different persons too, and every 2nd person had an additional letter associated with his/her serial number.
One of the two records 2043 and all skipped records were removed. All other records remained in the database.
 - b) Duplicated persons: All pairs of records reported as occurring: on the same day, and with the same YoB, and with the same 1st letter of the (dedia⁶) surname, were selected and checked manually by comparing all available data items (full 1st name, surname, YoB, sex, age, ethnicity, type of event etc). 193 such records were identified. Among those 193 records only 15 were duplicates (15 pairs, of which one is the duplicate on the serial number (2043)), even though small differences were noticed in, for example, spelling of the names. The rest were different persons. The 15 duplicated records were Marked on the duplo variable (code 2) and removed from the database.
- There were in total 5,870 unique records that remained in the database. Of the 5,870 records, 472 were deaths, 4,925 are not deaths (i.e. mainly wounded persons; including 3 unrelated cases), and 474 records are only available as records' sequential numbers (i.e. relate to incomplete entries and entries from missing pages; unclear whether alive or dead). Among the not dead, a number of persons had no indication of wounding at all but most of these persons were most likely wounded. These records were used in the analysis too.

The above-summary describes data entry and related problems as well as data cleaning and the contents of the database itself. Deficiencies and basic statistics from this database are discussed below.

4. ASSESSMENT OF DEFICIENCIES OF THE WAR HOSPITAL RECORDS AND MINIMUM NUMBERS OF VICTIMS

This section concentrates on deficiencies of the records available from the Protocol Books of the Mostar War Hospital. There are in total **5,870** cases reported in the WH Books (after cleaning), relating to **(up to) 4,925 wounded, 472 deceased** (that were wounded too), **3 unrelated** persons, and **474 unclear cases**. Most unfortunately, the WH books are far from a reasonable quality. The **limited coverage** of the books; (only a sample of all killed and

⁶ The term dedia is used to express removing diacritics from the original B/C/S names and replacing them with Latin letters (e.g. š with s, č with c etc.). This procedure is essential for successful matching of the names.

wounded are included in the books), **incompleteness** of this source; (i.e. several pages are missing altogether and also many responses are missing partly or entirely on many data items), and **other deficiencies of the available data** (e.g. spelling mistakes, errors in DoB etc.), are the reasons for being cautious when producing siege-related statistics.

Records reported in the War Hospital Books cover patients treated in the Mostar War Hospital during the conflict in Mostar in 1993-94. The first day of reporting is 9 May 1993 and the last day is 24 May 1994. The registration follows the order of calendar time. Day stamps (i.e. a complete date in the ddmmyy format) are consistently imprinted in the WH Books in the area of the first record taken on a given day. (Almost) every day is Marked with its own stamp, and a specific date can be assigned to (almost) every record. A few day stamps clearly cover two records instead of one. In such cases both records are considered as the two first ones to occur on this given day. Records are numbered consecutively by using sequential numbers, which (after data cleaning) are all unique.

The term “treated” means that any person who arrived at the Hospital in this period and received any type of treatment could be reported; it is uncertain that all actual patients are reported in the books, however. Individuals with less severe injuries could have been sent home without taking any notice of the treatment at all. Both the admitted and the not admitted (i.e. sent home) patients are reported. Four major categories of patients can be explicitly distinguished by markers and the availability of diagnosis: conflict-related **wounded**, conflict-related **killed**, **unrelated** cases (alive), and **undecided** cases (both alive and dead). From here on, I consequently use these terms throughout the rest of this report.

Wounded and killed persons are obviously related to the conflict. Note that killed persons were admitted to the hospital because of their injuries, (although for a number of persons this fact is not explicitly stated). The killed persons are considered in the report as wounded too. Unrelated patients, (only 3 out of 5,870 cases), ended in the War Hospital for reasons unrelated to the conflict, for example, for giving birth, which was caused by the lack of or restricted access to other health care facilities in the East Mostar at that time. The undecided cases are patients, (both survivors and deceased), for whom information is scattered and/or limited; they cannot be explicitly assigned to any of the other groups. Why the information is not complete for such a high number of records is related to the circumstances in which the hospital operated during the siege; the circumstances were dramatic and often made it impossible to the hospital staff to complete the records in the books. As I show in Section 5 of this report, there are no reasons, however, to believe that undecided cases were significantly different than a majority of all other records in the books, which obviously were war-related. So, it is rather certain that undecided cases should be seen either as wounded persons (those alive; not marked as dead) or as wounded and killed (those marked as dead). The undecided cases are included in siege-related statistics presented in this report.

Deficiencies of WH data on the deceased and on the wounded population are largely similar. An assessment of deficiencies is therefore made for the entire source (all possibly related cases, i.e. wounded, dead, and undecided cases, but excluding unrelated cases). From here on, all statistics in this section are related to all possibly related cases reported in WH books (unless explicitly stated that not). All possibly related cases cover wounded persons, deaths of wounds or injuries or other conflict-related causes, and undecided cases. Note also that one the same person could be wounded several times and in the end killed. My objective is first of all to characterise deficiencies of the War Hospital records, and secondly to identify the number of **conflict-related wounded patient-cases** (a concept similar to the term of person-days commonly used in short-term employment arrangements), here in particular civilians. I

will do that by showing **a minimum number** and by producing **a less conservative more real estimate** of wounded patient-cases.

4.1 Missing pages are the most serious deficiency of the WH Books (Table 1); a total of 465 records are on the missing pages, i.e. about 8% of all 5,867 WH records. In addition to this, 9 records are very incomplete; they lack names and most other details.

Table 1. Overview of Missing Pages

Type of Reporting	Count	Percent
Reported in WHB, with Names	5,393	91.9
Reported in WHB, No Names	9	0.2
Reported on Missing Pages	465	7.9
Total	5,867	100.0

Note: 3 records with names are excluded as unrelated

Table 2. Timing of Missing Pages

Month-Year	Count
May-93	181
Jun-93	274
Aug-93	10
Total	465

That some pages are missing is an obvious fact. It is clear from the gaps in the sequential numbers and missing day stamps. There is no reason to believe that the missing pages were inserted as missing intentionally. It is rather the chaos of the siege and its intensity that should be blamed for this. Almost all these pages are related to two first months of the conflict in East Mostar, i.e. May and June 1993, (see Table 2). As it is shown in statistics on timing, discussed more specifically further in this report, these two months belong to the most intensive episode of the conflict and at the same time, missing information is most considerable for this phase.

A problem related to the missing pages is the completeness of reporting of names (and of other personal details). Table 1 show that about 5,393 (92%) records are reported with names. Of those records with names, a small fraction has rather deficient names (171; only one name is available, or initials, or the handwriting is illegible). A vast majority of records without names are the records from missing pages (465; 7.9%). Only 9 (0.2%) additional records do not have names included implying that their usefulness is very limited.

As a consequence of the missing pages, names and other personal details are unavailable for 465 records which have to be excluded from siege statistics; despite that the 465 individuals (almost certainly) were victims of the siege and suffered injuries and some perhaps died.

4.2 Dates of arrival at hospital are available, however, for all patients registered in the WH Books from 9 May 1993 to 24 May 1994, also for those 465 patients registered on the missing pages.

Table 3. Overview of Multiple-Day Reports from Missing Pages (Only 1993)

Day	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
03-04	0	24	0	0	0	0	0	0	24
05-06	0	12	0	0	0	0	0	0	12
12-13	0	12	0	0	0	0	0	0	12
16-19	0	82	0	0	0	0	0	0	82
20-22	0	72	0	0	0	0	0	0	72
24-25	12	0	0	0	0	0	0	0	12
28-29	60	0	0	0	0	0	0	0	60
Total	72	202	0	0	0	0	0	0	274

Unfortunately, a specific day cannot be assigned to 274 records out of 465, due to the lack of day stamps in the WH books. For 274 patients whose records were listed on missing pages from May and June 1993, days are available as covering two- or even three-day periods, while month and year are exactly known (Table 3).

So even though the 465 records cannot be included in siege-related statistics, they could be analysed in the timing patterns, especially by month. Despite of this, all 465 records are excluded from all analyses, also from the analysis of timing.

4.3 One of the most essential items in the War Hospital records is the type of wounding. The original item Wound Type, and its recoded version, are shown in Table 4 below.

Table 4. Overview of Diagnosis (Wound Type) in War Hospital Records

Wound Type Original	Wound Type Re-Coded	Count	Percent
V.E.	shelling	2,088	38.72
V.T.	gunshots	298	5.53
V.S.	gunshots	159	2.95
Vulnus ...	shelling or gunshots	3	0.06
Beaten	beaten	1	0.02
<i>Gave birth</i>	<i>unrelated</i>	<i>2</i>	-
<i>Artificial limb</i>	<i>unrelated</i>	<i>1</i>	-
Unknown	unknown	2,844	52.74
<i>Miss names/pages</i>	<i>miss names/pages</i>	<i>474</i>	-
Total All	all	5,870	-
Total Valid	all excluding unrelated and miss names/pages	5,393	100.00

Notes:

- V.T. - *Transclopetarium*
- V.S. - *Vulnus Sclopetarium*
- V.E. - *Vulnus Explosiva*

In total, 5,870 records are reported in the War Hospital books. 2,549 cases out of 5,870 (47.3%, Tables 4 and 5) have a known and siege-related diagnosis specifying the causes of

hospitalization (shelling, gunshots and beaten). 2,844 cases out of 5,870 (52.7%) have an unknown diagnosis. These records belong to the category undecided or Not Marked as Wounded. As stated before, no reasons exist to believe that undecided cases were significantly different than the cases of wounded (or wounded and killed) persons. So, a majority of the records in the WH Books relate to the wounded persons, except of the records explicitly stated to be unrelated. Three such records were identified (two women gave birth and one men was admitted for making an artificial limb). These three records and the records of missing names/pages (474) were excluded from any further analysis. The remaining 5,393 records were studied for making estimates of the siege-related wounded person-cases.

Generally, all records for which a specific diagnosis of gunshots or shelling, and also one beaten by Ustasha, were defined as Marked as Wounded. All cases with unavailable diagnosis were considered as Not Marked as Wounded (Table 5).

Table 5. War Hospital Cases According to Indication of Wounding

Indication of Wounding	Count	Percent
Marked as Wounded	2,549	47.3
Not Marked as Wounded	2,844	52.7
Total	5,393	100.0

Table 5 summarizes the distribution of the WH records according to the availability of diagnosis. Out of the total of 5,393 valid hospital cases, 2,549 (47.3%) patients were Marked as Wounded, i.e. their diagnosis was available and siege-related. Another 2,844 (52.7%) cases were Not Marked as Wounded; thus they had no diagnosis mentioned in the WH books.

Based on Table 5, only 2,549 persons could be counted (in a strict approach) as wounded in the siege of East Mostar. This number is a minimum that has little to do with the reality of the siege.

4.4 Table 6 contains an overview of causes of wounding. Some 2,549 (47.3%) records are reported as wounded with a specific diagnosis available. A majority of those are cases of wounding by shelling 2,088 (38.7%). 457 cases (8.5%) are results of gunshots. Just 3 cases relate to either shelling or gunshots and 1 case to beating.

Table 6. Wound Type Distribution in War Hospital Records

Type of Wounding	Count	Percent
Shelling	2,088	38.7
Gunshots	457	8.5
Shelling or Gunshots	3	0.1
Beaten	1	0.0
Unknown	2,844	52.7
Total	5,393	100.0

4.5 The distinction between civilians and military personnel is one of the most essential in presenting estimates of conflict casualties. Two original items in the War Hospital books make it possible to study these two groups of patients, Status and Military Unit. Using these

two items a new variable was created. All records with Military Unit available were consistently coded as military status, disregarding the value on Status. All remaining records reported as C (civilian) or V (soldier) were kept as civilian and military status. All missing values (no indication and no information cases) were coded into unknown. The results of the coding are summarised in Table 7.

Table 7. Status of Patients According to the Internal Definition from on the WH Books

Military vs. Civilian Status	Count	Percent
Civilian	1,215	22.5
Detainee	49	0.9
Military	1,341	24.9
Unknown	2,788	51.7
Total	5,393	100.0

A total of 1,215 (22.5%) cases are marked as civilians and 1,341 (24.9%) cases as soldiers. A majority of all cases (2,788 or 51.7%) are of unknown status, however. A small group of 49 cases are detainees. Out of 49 in total, exactly 31 detainees have been identified as Croats, 5 as Bosniaks, and 13 as unknown. Whether they were civilians or soldiers is unclear; it is not possible to determine their status from the available information. We keep them as a separate group.

4.6 Table 8 below shows how many cases specifically reported as civilians, detainees or militaries are Marked at the same time as wounded. In other words, it shows how many known status cases also have the cause of hospitalisation available and related to the conflict.

Table 8. Internally Defined Status and the Indication of Wounding in WH Books

Internal definition of Status				
Military vs. Civilian Status	Marked as Wounded	Not Marked as Wounded	Total	Percent
Civilians (number)	831	384	1,215	22.5
Civilians (percent)	68.4	31.6	100.0	-
Detainees (number)	29	20	49	0.9
Detainees (percent)	59.2	40.8	100.0	-
Militaries (number)	952	389	1,341	24.9
Militaries (percent)	71.0	29.0	100.0	-
Unknown (number)	737	2,051	2,788	51.7
Unknown (percent)	26.4	73.6	100.0	-
Total (number)	2,549	2,844	5,393	100.0
Total (percent)	47.3	52.7	100.0	-

Exactly 831 (68.4%) civilians, 29 (59.2%) detainees, and 952 (71%) militaries have the cause of hospitalisation available. Another 737 (26.4%) cases are known to be wounded but the status of these cases is unknown. In total 1,812 cases out of all 5,393 records (33.6%) are valid on both items, Status and Marked as Wounded. This number (1,812) can be seen as a minimum number of civilians, detainees and soldiers who got wounded during the siege of East Mostar between 9 May 1993 and 24 May 1994. The minimum number of wounded civilians (patient-cases) is 831, (or 860 together with the detainees), and of soldiers is 952 (patient-cases). For all these cases the time, place and cause of wounding are available and related to the siege.

The minimum numbers are heavily underestimated. First of all, because of the severely incomplete register of wounded persons available for Mostar (i.e. War Hospital Books with many missing pages and frequent missing values on the available data items), and secondly because of records registered outside of War Hospital in emergency and/or stationary in-patient medical facilities in Mostar.

4.7 In order to confirm the reporting of military status, external lists of fallen soldiers from the ABH (and HVO) were compared with the WH Books. In this way, also some WH cases of the unknown status could be re-coded using an external definition of the status. This step was possible due to the availability of the complete lists of fallen soldiers from ABiH and HVO (1992-95), provided to the Demographic Unit by the Ministry of Defence of Bosnia and Herzegovina in the years 2001 and 2002. The coverage of these lists is the entire country and the whole war period.

The assumption underlying the cross-referencing of these lists is that many of the fallen soldiers who died in the conflict in Herzeg-Bosnia were also wounded during the siege of Mostar and treated in the Mostar War Hospital. Thus, records of all such soldiers can be linked with their respective records from War Hospital books. Having achieved this, new cases of soldiers can be marked in War Hospital records, while keeping the status of all remaining cases unchanged. In this way, the definition of Status based so far exclusively on the internal War Hospital reporting can be broadened by using external information. In addition to that, fallen soldiers identified in War Hospital records as wounded persons can be also considered as new killed persons. Thus, all fallen soldiers not yet reported as killed in War Hospital books can be marked as additional deaths.

Table 9 below gives an overview of WH records linked with the records of the fallen soldiers, from the Bosnian army (ABiH) as well as from HVO. In total 218 records were matched. All matches were checked visually and were consistent on first name, last name, year of birth, date of death and date of wounding. Minor difference in spelling were allowed for, no differences in the year of birth, and only consistent differences between dates of death and of wounding.

Table 9. Overview of War Hospital Records Matched with the Lists of Fallen Soldiers

Original Status	Ethnicity			Total
	Muslim	Croat	Unknown	
Civilians	11	0	4	15
Detainees	0	9	2	11
Militaries	81	0	19	100
Unknown	80	0	12	92
Total Matched Soldiers	172	9	37	218

Exactly 100 records previously coded as soldiers were confirmed as soldiers (mainly Bosniaks). 11 records of WH detainees changed into soldiers (most of them Croats) and 15 records of WH civilians changed into soldiers too (most of them Bosniaks). In addition to this, 92 records, previously coded as unknown (or unavailable) status, became known as military status. A majority of these records were again of Bosniaks. Table 10 below summarises new statistics on patients of War Hospital obtained by applying the external definition of status.

Table 10. Externally Defined Status and the Indication of Wounding in WH Books

External Definition of Status

Military vs. Civilian Status	Marked as Wounded	Not Marked as Wounded	Total	Percent
Civilians (number)	819	381	1,200	22.3
Civilians (percent)	68.3	31.8	100.0	-
Detainees (number)	23	15	38	0.7
Detainees (percent)	60.5	39.5	100.0	-
Militaries (number)	1,006	453	1,459	27.1
Militaries (percent)	69.0	31.0	100.0	-
Unknown (number)	701	1,995	2,696	50.0
Unknown (percent)	26.0	74.0	100.0	-
Total (number)	2,549	2,844	5,393	100.0
Total (percent)	47.3	52.7	100.0	-

According to the external definition of Status, there were 819 (68.3%) civilians, 23 (60.5%) detainees, and 1,006 (69%) militaries for whom the Status and Wound Type were concurrently available. Another 701 (26%) individuals are known to be wounded but their status is unknown.

Altogether the minimum number of wounded civilians, detainees and militaries obtained from the external definition of status is 1,848 (vs. 1,812 based on the internal definition). The improvement achieved is mainly related to the number of soldiers in WH records.

The overall conclusion from applying the external definition of status is that even though the improvement achieved is minor, the coding is more correct. Slightly more records are now coded as militaries, less as civilians and detainees, which is in line with the conservative approach.

4.8 Two more tables are included below in order to illustrate deficiencies of two more items: Sent Home and Ethnicity (Tables 11 and 12). These two tables again address the incompleteness problem and its impact on the quality of statistics that can be produced from war Hospital data. Note that Ethnicity originally was not reported in the War Hospital books. It was created during data entry on the basis of studying names. Native B/C/S speakers decided on the ethnicity based on their knowledge of naming traditions in Bosnia. Note also that hand writing is very unclear and spelling is often uncertain. For these reasons Ethnicity is not one hundred percent reliable.

Table 11. Overview of Admission Status of Records from War Hospital Books

Admission vs. Sent Home	Count	Percent
Marked as Sent Home	1,516	28.1
Marked as Admitted	1,375	25.5
Not Marked	2,502	46.4
Total	5,393	100.0

Table 12. Overview of Ethnicity of Individuals Reported in the War Hospital Books

Ethnicity	Count	Percent
Muslim	4,160	77.1
Croats	97	1.8
Unknown	1,136	21.1
Total	5,393	100.0

4.9 All in all, the War Hospital records appear to be very deficient. Incompleteness is a serious problem, which implies that the minimum numbers obtained from the War Hospital Database are extremely low and basic demographic distributions of casualties are poor. All this is most certainly not compatible with the reality of the siege. For these reasons, an attempt is made in the next sections to produce more complete estimates of the casualties (here = wounded person-cases). The new estimates are still exclusively based on War Hospital records.

5. Age, Sex and Timing Patterns of Patients Marked and Not Marked as Wounded

The risk of being wounded or killed in the siege of East Mostar can be seen as related to several factors. The most significant factors having impact on this risk include:

- being an ethnic Muslim or another Non-Croat (i.e. belonging to those exposed to the risk of violence from a better armed and larger force),
- physically being present in the area of East Mostar during the siege period,
- being exposed to intense and frequently occurring incidents,

- active siege-related behaviour, i.e. being engaged in combat as opposed to life supporting activities, (i.e. being a combatant or a civilian),
- general risk-taking behaviour that can be approximated by basic demographic characteristics of a person such as age and sex; sex and age being determinants of human behaviour in general.

A meaningful analysis of the wounding process should be made using records of relevant wounded persons (from East Mostar and siege period) by (at least) age, sex, ethnicity, and place, time and cause of wounding. It should also include the military status of these individuals (civilians/soldiers). Information from the War Hospital Books makes it relatively easy to define the victims of wounding in terms their actual presence in East Mostar in the relevant period of time as well as in terms of their sex, age, and even ethnicity. It is much more difficult to define them in terms of the availability of diagnosis (Marked versus Not Marked as Wounded) and military status.

I discussed deficiencies of the availability of diagnosis and military status in Section 4. The major problem in both cases was the incompleteness of reporting, i.e. extraordinarily high number of records with missing values on each (or just one) of the two items. The missing values were most likely the result of underreporting of wounding by medical authorities responsible for keeping hospital records up-to-date and in good order. At the same time, many other records from the War Hospital Books had these two (and other) items available, and thus they could serve as a basis for an estimation of more complete statistics on siege-related wounded persons from East Mostar.

Generally speaking if two groups of individuals, (i.e. those Marked and those Not Marked as Wounded), physically located in East Mostar during the siege period and exposed to the same risk of being wounded, had the basic demographic distributions (such as sex and age) consistently similar, there would be no reason to assume that these groups arrived in the War Hospital because of totally different health problems.

In this section I therefore check statistically whether the sex and age distribution of patients Marked and Not Marked as Wounded are similar. I do this separately for civilians and militaries. My expectation is that no significant differences will be found between those Marked and those Not Marked as Wounded. If so, then these two groups could be seen as largely similar and an adjustment would be possible of the minimum numbers presented in Section 4 in order to produce statistics that describe the actual wounding process in more realistic (although still lower level) terms.

I also investigate the timing of the siege. And again ideally I would like to see similar patterns of timing for those Marked and those Not Marked as Wounded. (Again done separately for civilians and militaries). The expectation might be however too optimistic as I already saw a considerable underreporting of wounding in particular siege periods (e.g. May-June 1993). A systematic pattern of underreporting of one group implies that timing of this group and of a second group cannot be the same.

In this section, I use all available War Hospital records, except for the previously excluded records from missing pages or with missing names (474). In total, after excluding the 474 records from missing pages/names, exactly 5,393 records remain. Three major items are studied: sex, age, and timing⁷, each separately for civilians, militaries and those of the

⁷ In fact also place of event could be studied, but generally the place is known to be within East Mostar for all records reported.

unknown status. Generally, two major sub-populations are compared: Marked as Wounded versus Not Marked as Wounded, with the purpose of investigating whether or not those Not Marked as Wounded can be still considered as representing the same overall population of wounded persons related to the siege of East Mostar.

In addition to the descriptive analysis in this section, in Annex I also tested statistically the significance of the differences in age, sex and timing distribution of those Marked and those Not Marked as Wounded (separately for civilians and militaries; no test for all status categories jointly). The (one-sample) Kolmogorov-Smirnov test of goodness-of-fit was applied to test whether these differences are significant statistically. Generally, the test's results confirm (what is also shown in this section) that these two groups are not different and can be considered as representing the general population of wounded persons.

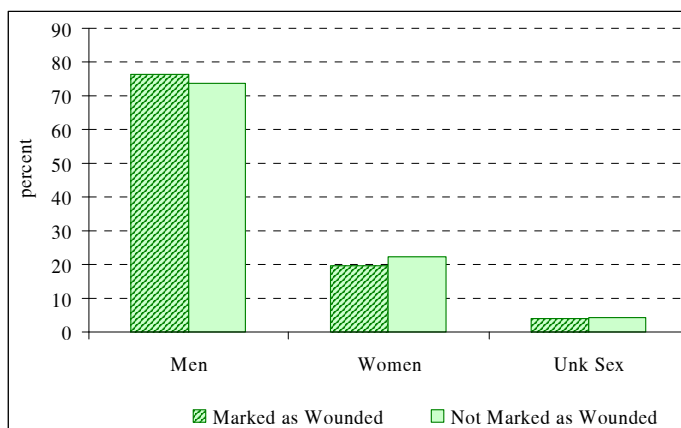
Based on the results from this section and those from the Kolmogorov-Smirnow test, in Section 6 I determine the size of the populations affected by the siege of East Mostar. This new estimates should be seen as more complete and better justified numbers of casualties, yet these new estimates still belong to lower values of the unknown true number of casualties.

5.1 Sex patterns of those Marked as Wounded and those Not Marked as Wounded are largely similar (Table 13 and Figure 1); it so despite of the fact that the individuals treated in the War Hospital comprised both civilians and soldiers that usually have distinguished age profiles. This similarity can be seen as a first indication that the persons Not Marked as Wounded belong to a population that was treated in War Hospital for the same reasons as the individuals Marked as Wounded.

Table 13. Sex Patterns among Marked and Not Marked as Wounded

Sex	Mark of Wounding		Total	Sex	Mark of Wounding		Total
	No	Yes			No	Yes	
Men	2,093	1,945	4,038	Men	73.6	76.3	74.9
Women	630	504	1,134	Women	22.2	19.8	21.0
Unk/Unav	121	100	221	Unk/Unav	4.3	3.9	4.1
Total	2,844	2,549	5,393	Total	100	100	100

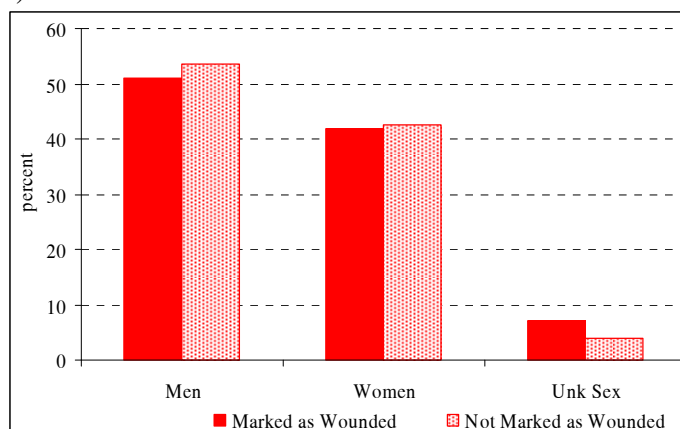
Figure 1. Sex Patterns among Marked and Not Marked as Wounded



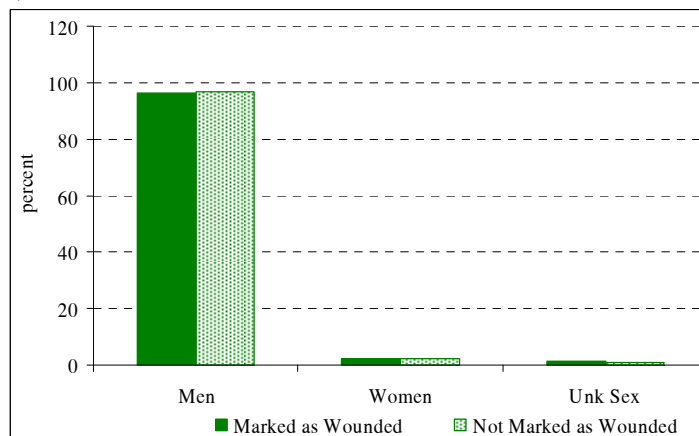
I also compared the sex of Civilians, Militaries and Unknown Status according to the Marked as Wounded Distribution. Three sets of the resulting charts are included below (Figures 2a, 2b and 2c; data tables associated with these charts and results of the related Kolmogorov-Smirnov test are available from the Annex). The charts indicate that the sex patterns are not the same for Civilians as compared with Soldiers, or with Unknown Status⁸. At the same time, the sex distributions of those Marked as Wounded and those Not Marked as Wounded are very similar within every category of the status.

Figure 2. Sex Distribution and Diagnosis Availability

a) Civilians

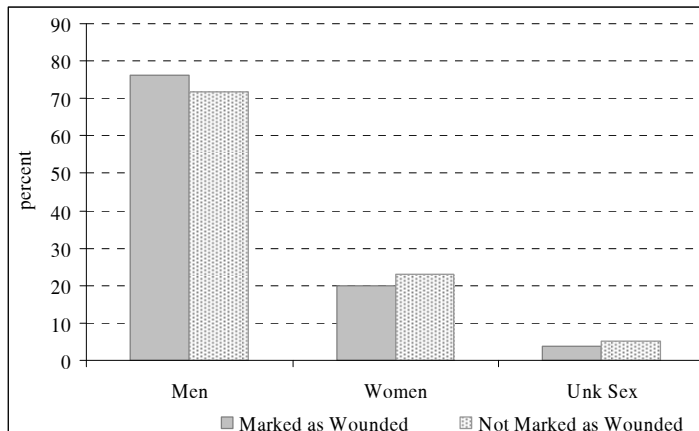


b) Militaries



⁸ Persons of Unknown Status are obviously a combination of both civilians and soldiers (Figure 2c); this category of Status has only a little relevance for investigating the similarities/differences of those Marked and those Not Marked as Wounded. The categories of civilians and militaries are the most essential ones with this regard.

c) Unknown Status



Among civilians about 50% are men and about 40% are women (Figure 2a), whereas among soldiers almost all are men (Figure 2b). The sex distribution of persons with unknown status is clearly the same as the cumulative distribution of both civilians and soldiers (Figure 2c). The sex distributions of persons Marked and Not Marked as Wounded are almost identical within every category of the status.

The Kolmogorov-Smirnov test confirms that the differences observed in the sex distribution of those Marked as Wounded and those Not Marked as Wounded are statistically insignificant. This result holds true for civilians as well as for militaries. Thus, for both civilians and militaries these two groups (Marked and Not Marked as Wounded) can be seen as representing the same population of wounded persons related to the siege of East Mostar.

5.2 Based on the visual inspection also the age patterns of those Marked as Wounded and those Not Marked as Wounded are largely similar (Table 14 and Figure 3). This further confirms that the persons Not Marked as Wounded do not form a distinguished population, which was treated in War Hospital for reasons different than the population Marked as Wounded.

Figure 3. Age Patterns among Marked and Not Marked as Wounded

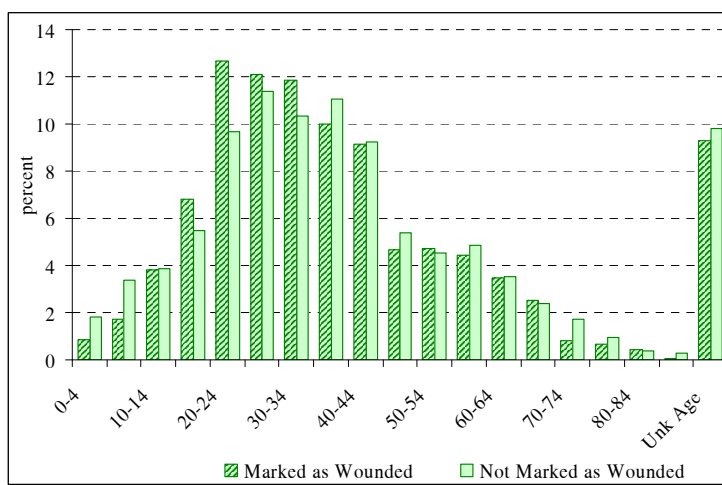


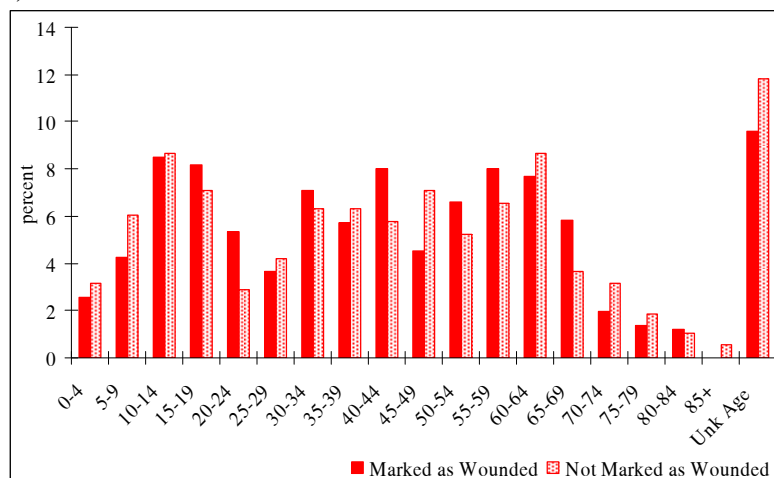
Table 14. Age Patterns among Marked and Not Marked as Wounded

Age	Mark of Wounding		Total	Age	Mark of Wounding		Total
	No	Yes			No	Yes	
0-4	52	22	74	0-4	1.83	0.86	1.37
5-9	96	44	140	5-9	3.38	1.73	2.60
10-14	110	96	206	10-14	3.87	3.77	3.82
15-19	156	172	328	15-19	5.49	6.75	6.08
20-24	276	323	599	20-24	9.70	12.67	11.11
25-29	323	308	631	25-29	11.36	12.08	11.70
30-34	292	302	594	30-34	10.27	11.85	11.01
35-39	314	254	568	35-39	11.04	9.96	10.53
40-44	263	233	496	40-44	9.25	9.14	9.20
45-49	153	119	272	45-49	5.38	4.67	5.04
50-54	129	121	250	50-54	4.54	4.75	4.64
55-59	138	113	251	55-59	4.85	4.43	4.65
60-64	101	89	190	60-64	3.55	3.49	3.52
65+	162	115	277	65+	5.70	4.51	5.14
Unk/Unav	279	238	517	Unk/Unav	9.81	9.34	9.59
Total	2,844	2,549	5,393	Total	100.00	100.00	100.00

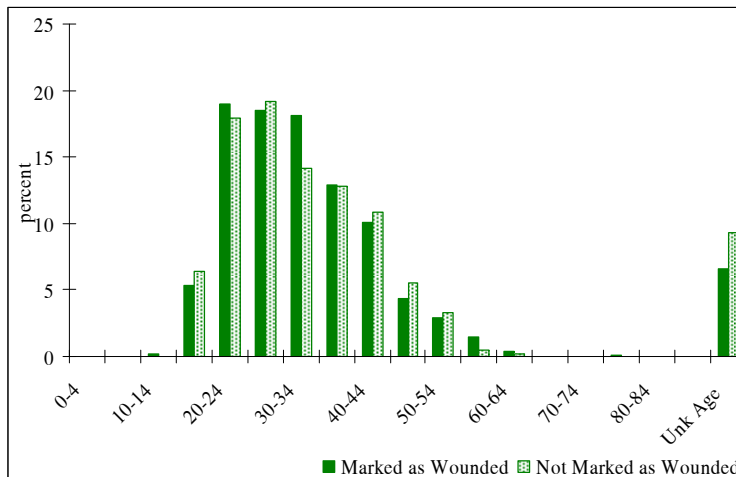
Results of comparing of the age pattern of Civilians, Militaries and Unknown Status according to the Marked as Wounded Distribution are shown below (Figures 4a, 4b and 4c; data tables and the Kolmogorov-Smirnov test associated with these charts are available from the Annex). The age patterns are not the same for Civilians as compared with Soldiers, or with Unknown Status. However, the age distributions of Marked as Wounded and Not Marked as Wounded are very similar within every status category.

Figure 4. Age Distribution and Diagnosis Availability

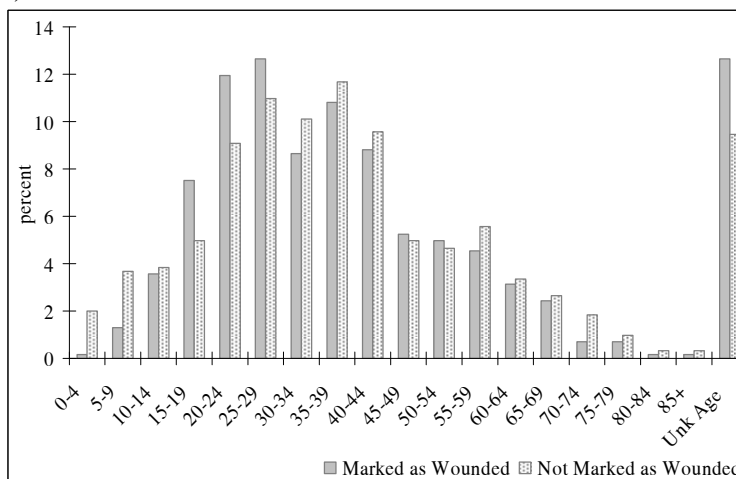
a) Civilians



b) Militaries



c) Unknown Status



The age distribution of civilians has three peaks in the age intervals 10-19, 30-44 and 55-64 years (Figure 4a). The age distribution of soldiers has one wide peak at ages 20-44 years (Figure 4b). The age distribution of persons with unknown status is clearly the same as the cumulative distribution of both civilians and soldiers (Figure 4c). The age distribution of the persons Marked as Wounded and Not Marked as Wounded are again almost identical within every category of the status.

The Kolmogorov-Smirnov test confirms that the differences observed in the age distribution of those Marked as Wounded and those Not Marked as Wounded are statistically insignificant. The same result was obtained for civilians and for militaries. In terms of age, these two groups (Marked and Not Marked as Wounded) can be seen as representing the same population of wounded civilians (or wounded militaries) related to the siege of East Mostar.

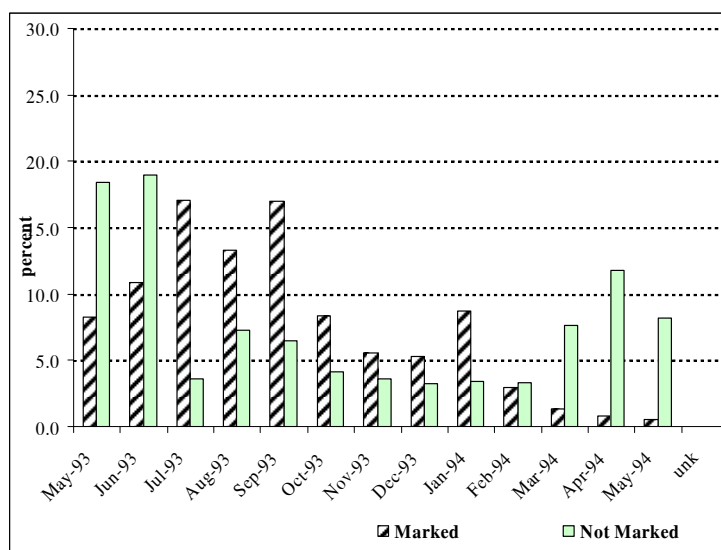
5.3 Timing of those Marked and those Not Marked as Wounded clearly have different patterns (Table 15 and Figure 5). In particular, the months May-93, June-93, and March-94, April-94 and May-94 show exceptionally high levels of arrivals of persons Not Marked as Wounded. Together with February-94, these are the only months when arrivals of those Not Marked as Wounded are higher than the arrivals of those Marked as Wounded.

May-93 and June-93 are known from other sources (Rajkov, ERN: 0200-0456) of heavy underreporting of diagnosis (Marked as Wounded). Note that records from missing pages (mainly from May and June 1993) have been excluded from these particular analyses, but still the profound underreporting of Marked as Wounded in May and June 1993 is obvious in Table 15 and Figure 5.

Table 15. Timing of Arriving at War Hospital among Those Marked and Not Marked as Wounded

Month/Year	Mark of Wounding		Total	Month/Year	Mark of Wounding		Total
	No	Yes			No	Yes	
May-93	524	210	734	May-93	18.42	8.24	13.61
Jun-93	540	277	817	Jun-93	18.99	10.87	15.15
Jul-93	101	434	535	Jul-93	3.55	17.03	9.92
Aug-93	206	339	545	Aug-93	7.24	13.30	10.11
Sep-93	184	432	616	Sep-93	6.47	16.95	11.42
Oct-93	118	214	332	Oct-93	4.15	8.40	6.16
Nov-93	101	141	242	Nov-93	3.55	5.53	4.49
Dec-93	92	136	228	Dec-93	3.23	5.34	4.23
Jan-94	98	222	320	Jan-94	3.45	8.71	5.93
Feb-94	94	75	169	Feb-94	3.31	2.94	3.13
Mar-94	217	34	251	Mar-94	7.63	1.33	4.65
Apr-94	335	21	356	Apr-94	11.78	0.82	6.60
May-94	233	13	246	May-94	8.19	0.51	4.56
Unk	1	1	2	unk	0.04	0.04	0.04
Total	2,844	2,549	5,393	all	100.00	100.00	100.00

Figure 5. Timing of Arriving at War Hospital among Those Marked and Not Marked as Wounded



The months of March-94, April-94, May-94, and partly also February-94 cover the period after the Washington agreement. Thus, wounded persons were less frequent in these months and patients arriving at War Hospital were coming there for other reasons. Many of them

could have come for the treatment of late consequences of wounds or similar problems. Secondly, marking persons as wounded became less relevant in these months as officially the conflict ended around 25 February 1994, and some underreporting was probably in place too. In conclusion, on the contrary to the period until February 1994, the timing of events occurring after February 1994 describes a different process than the intensity of the siege. This process should be, however, seen as related to the siege. All health problems that cumulated during the siege and were postponed because of difficult life circumstances under the siege were finally explicitly addressed to health authorities in the first months after the siege ended.

All in all, it seems that in order to properly describe the timing of incidents during the siege, it is necessary to analyse both Marked and Not Marked as Wounded jointly, despite of the differences observed in the timing of arrivals of these two groups at the War Hospital. Merging the two groups (those Marked as Wounded and those Not Marked as Wounded) is a solution to the obvious underreporting of wounding in May-June 1993 and in February-May 1994.

A good alternative to this is studying the total daily number of patients arriving at the War Hospital (see Figure 6). According to this indicator, the intensity of the siege was the highest in May and June 1993. The second most intensive period is apparently September 1993, and the third is January 1994. The increase in the daily number of patients after February 1994 should be mainly seen as treatment of late consequences of the siege.

Figure 6. Timing of Arriving at War Hospital among Those Marked and Not Marked as Wounded

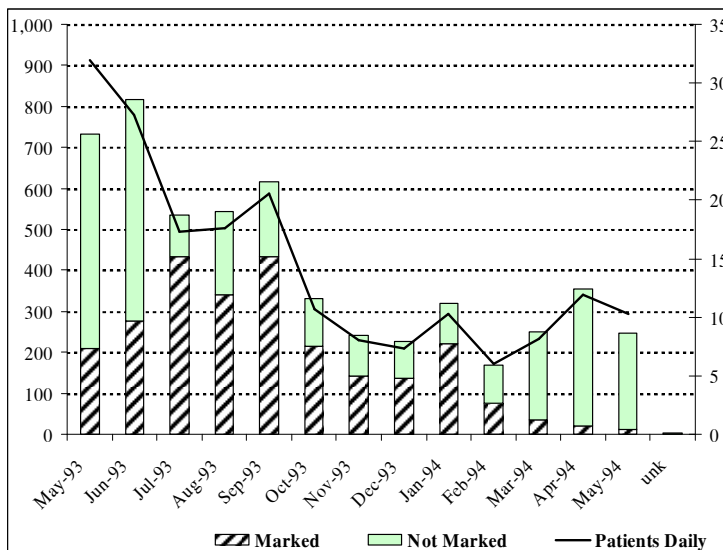
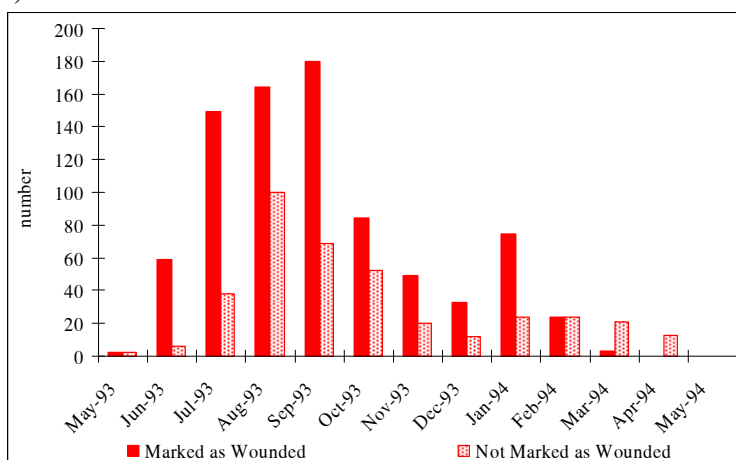
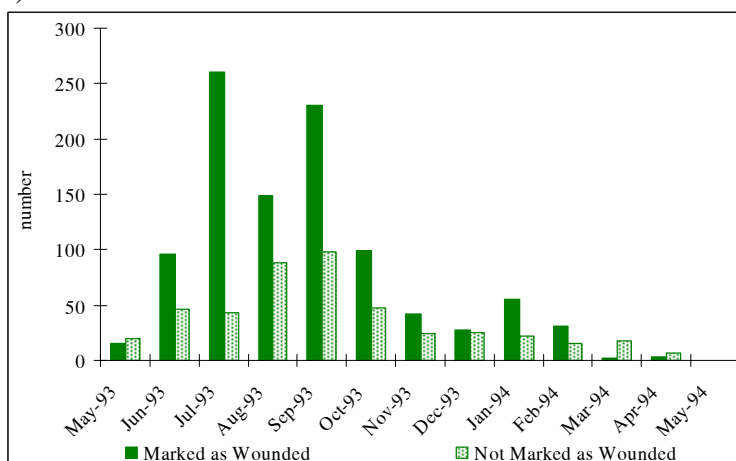


Figure 7. Timing Distribution and Diagnosis Availability

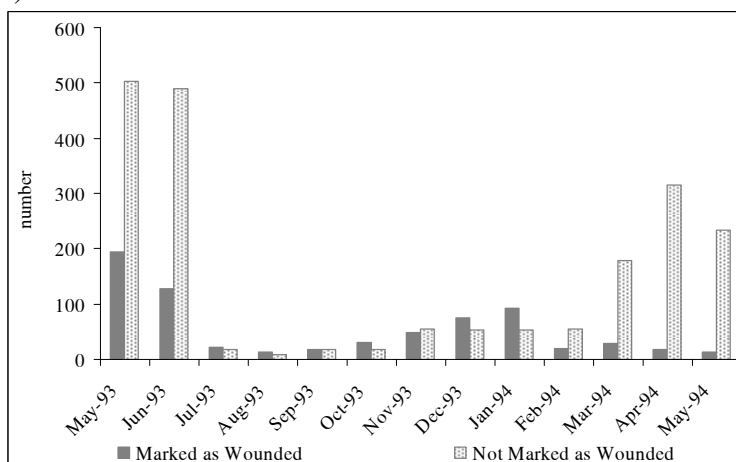
a) Civilians



b) Militaries



c) Unknown Status



Interestingly, Figure 7a shows that for civilians the timing of patients' arrivals at the War Hospital has a rather similar pattern for those Marked and those Not Marked as Wounded. However, the level of the arrivals of those Not Marked as Wounded is clearly considerably lower. The timing pattern of both groups (those Marked and Not Marked as Wounded) indicates that most arrivals of civilians took place in July-August-September 1993, and later in October 1993, and January 1994. A similar observation applies to the militaries (Figure 7b), although less arrivals of militaries were noted in August 1993 than of civilians in the same month.

For those with the unknown status, the timing of those Marked as Wounded and those Not Marked as Wounded is similar only from July 1993 to January 1994. The arrivals of those Not Marked as Wounded in May-June 1993 and February-March-April-May 1994 are much higher than the arrivals of those Marked as Wounded in these periods (Figure 7c). Figure 7c confirms again the temporal pattern of underreporting of wounding which is clear in May-June 1993 and February-March-April-May 1994.

Statistical testing of the differences between Marked and Not Marked as Wounded confirms that significant differences exist for civilians as well as for militaries. This suggests that the timing of wounding was different for these two groups. However, having explained that the differences were caused by a systematic bias of underreporting of wounding in May-June 1993 and in February through May 1994, combining these two groups is necessary for being able to properly describe the overall timing of incidents during the siege.

5.5 The results presented in Section 5 confirm that the population of patients Marked as Wounded is not different in terms of age and sex from the population of those Not Marked as Wounded. This observation holds true for each distinguished group of patients, i.e. for civilians and also for militaries. Timing of arrivals at the War Hospital does not confirm to this rule, however. Different patterns of timing have been found for those Marked and Not Marked as Wounded, also when the civilian-military status is taken into account. Generally, the differences in the timing in May-June 1993 and February-March-April-May 1994 were related to the fact that a large number of arrivals had not been Marked as Wounded in these months. This observation is an expression of a systematic reporting bias inherent in the War Hospital records and not of the true data pattern. This is why also in the case of timing, the records of those Marked and Not Marked as Wounded may and should be combined and analysed jointly.

6. FINAL RESULTS

- **A minimum number** of wounded persons that acquired their injuries during the siege of East Mostar between 9 May 1993 and 25 May 1994 and were treated in the Mostar War Hospital is **2,549**.⁹ This number is based on cases that have diagnosis explicitly stated in their hospital records and the diagnosis is clearly siege-related, (Tables 4 and 5, Section 4).
- This number (2,549) is most certainly a heavy underestimation; **a better estimate is 5,393** wounded persons and is based on all records from the WH Books, disregarding whether or not the diagnosis is available, (Tables 4 and 5, Section 4). The 5,393 cases still do not properly represent the actual number of wounded persons as they do not include 474 records of patients whose names and other details were reported on the missing pages

⁹ 13 persons out of 2,549 are reported for May 1994.

of the WH Books, or their names and other personal details were unavailable in the WH Books.

- An additional reason for the 5,393 cases being an under-representation of all wounded persons is that the Mostar War Hospital was not the only medical facility in East Mostar at the time, although it was most likely the largest one. Four out-patients clinics and another four emergency clinics were operating in this area during the siege too and many patients contacted these clinics (e.g. for having access to, convenience or less severe injuries) instead of coming to the War Hospital.
- It is hard to estimate the complete number of wounded persons as no data is available from the eight out-patients facilities.
- It is also impossible to assess the type and severity of the injuries as the WH records are rather poor. The only measure that can be calculated is the fatality rate among the admissions (the number of deaths divided by the number of all patients with injuries). This rate would be equal 80 per 1,000 admissions if all 5,867 persons reported in the WH Books are taken into account. (Note, the fatality rate would be 185 per 1,000 if only the minimum number of 2,549 wounded persons is considered). The conservative rate of 80/1000 is high.
- The **distribution of causes of patients' injuries**, obtained from the diagnosis mentioned in the War Hospital Books, is attached below in **Table 16** (comp. Table 6, Section 4).

If only the cases of available and well-defined diagnosis are considered (2,549), about 82 % of the diagnosed patients acquired their injuries from shelling, and the remaining (approximately) 18% from gunshots. A very small fraction of patients were victims of either shelling or gunshots, or beating (about 0.1 %; 4 persons). The minimum number of shelling victims was 2,088; it is possible and likely that this number was much higher and equalled approximately 4,418, however. The minimum number of gunshots victims was 457, but more likely 967.

Table 16. The Minimum and Estimated Overall Numbers of Wounded Persons According to the Cause of Wounding

Wound Type	Minimum (Observed)	Percent (Observed)	Estimated (Adjusted)	Percent (Adjusted)	Confidence Interval	
					Lower Limit	Upper Limit
Shelling	2,088	81.9	4,418	81.9	4,377	4,458
Gunshots	457	17.9	967	17.9	927	1,007
Shelling or Gunshots	3	0.1	6	0.1	3	10
Beaten	1	0.0	2	0.0	0	4
Unknown	2,844	na	na	na	na	na
Missing names/pages	474	na	na	na	na	na
Total	5,867	100.0	5,393	100	5,307	5,479

The more likely numbers are estimates, which are more complete than the observed minimum numbers. The estimates were obtained through including in the adjusted statistics all cases of treatments in the War Hospital, disregarding the availability of their diagnosis. There were in total 2,844 cases without the diagnosis in the War Hospital Books; these cases were re-distributed in Table 16 according to the observed distribution of diagnosis and resulted in the adjusted estimated numbers of wounded persons.

Persons reported on the missing pages or whose records contained no names were excluded from this adjustment (474).

The statistical procedure applied to obtain the estimates and related confidence intervals is described in Section 2 in the Annex.

- The civilian - military status of victims can be analysed based on the Mostar War Hospital records too. The final figures are shown in Tables 17, 18a and 18b below (see also Table 10, Section 4).

Table 17. The Minimum and Estimated Overall Numbers of Wounded Persons According to the Status

Status Category	Minimum	Percent	Estimated	Percent	Confidence Interval	
	(Observed)	(Observed)	(Adjusted)	(Adjusted)	Lower Limit	Upper Limit
Civilian	1,200	44.49	2,400	44.49	2,349	2,450
Detainee	38	1.41	76	1.41	64	88
Military	1,459	54.10	2,917	54.10	2,867	2,968
Unknown	2,696	na	na	na	na	na
Missing names/pages	474	na	na	na	na	na
Total	5,867	100.00	5,393	100.00	5,280	5,506

Note: External Definition of Status was used

Table 18a. The Minimum and Estimated Overall Numbers of Wounded Civilians According to the Age and Sex Distribution

Age	Minimum Observed			Total	Estimated Adjusted		
	Men	Women	Unk Sex		Men	Women	Total
0-4	18	13	2	33	42	31	74
5-9	29	26	3	58	68	62	129
10-14	62	38	2	102	140	87	227
15-19	46	43	4	93	107	101	208
20-24	17	35	3	55	40	83	123
25-29	17	26	3	46	40	62	103
30-34	20	52	9	81	50	131	181
35-39	29	35	7	71	71	87	159
40-44	39	40	9	88	96	100	196
45-49	40	20	4	64	95	48	143
50-54	46	25	3	74	106	59	165
55-59	61	24	6	91	145	58	203
60-64	60	34	2	96	136	78	214
65+	78	38	8	124	185	91	276
Unk Age	60	55	9	124	na	na	na
Total	622	504	74	1,200	1,321	1,079	2,400
Percent	51.83	42.00	6.17	100.00	55.05	44.95	100.00

Table 18b. The Minimum and Estimated Overall Numbers of Wounded Militaries According to the Age and Sex Distribution

Age	Minimum Observed			Total	Estimated Adjusted		
	Men	Women	Unk Sex		Men	Women	Total
10-14	1	0	1	2	4	0	4
15-19	81	1	1	83	177	2	179
20-24	266	5	2	273	577	12	590
25-29	267	5	2	274	580	12	592
30-34	236	5	5	246	519	12	532
35-39	179	4	3	186	392	10	402
40-44	146	3	1	150	317	7	324
45-49	67	1	1	69	146	2	149
50-54	41	3	0	44	88	7	96
55-59	17	0	0	17	37	0	37
60-64	4	1	0	5	9	2	11
65+	1	0	0	1	2	0	2
Unk	100	6	3	109	na	na	na
Total	1,406	34	19	1,459	2,848	69	2,917
Percent	96.37	2.33	1.30	100.00	97.64	2.36	100.00

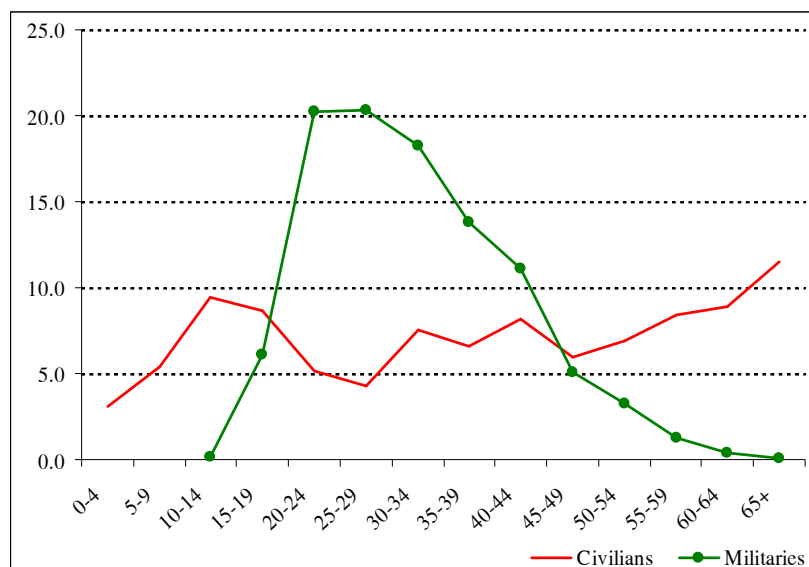
Table 17 contains the minimum numbers (observed) as well as the more complete estimates (adjusted). There were at least 1,200 civilians injured in the siege of Mostar; more likely, however, the number of wounded civilians was 2,400 (an estimate). The number of wounded militaries was at least 1,459 individuals, but a more complete estimate of wounded militaries is approximately twice as many, i.e. 2,917.

The ratio of wounded civilians to wounded militaries was 0.8225, i.e. about 8 civilians were wounded per each 10 militaries. The sex distribution of this ratio was extremely uneven. For women the ratio equalled 14.8235 (148 female civilians per 10 female militaries) and for men 0.4424 (4 male civilians per each 10 male militaries). Thus, a vast majority of wounded women were civilians and of wounded men were militaries.

The sex and age distributions of each status category are shown in Tables 18a, 18b and in Figure 8.

Whereas the age distribution of the militaries spreads over the ages from about 15 to 65 years and rapidly picks up at ages around 20 to 29 years, that of civilians relates to the entire age range of the population and is much more uniform. A hump is clearly seen for civilians at around 15 to 19 years of age, and then at the older ages (55 years or more).

Figure 8. Percentage Distribution of Patients of the Mostar War Hospital According to the Civilian-Military Status and Age



- The ethnicity of wounded persons is reported in Table 19. The most victims were ethnic Muslims (97.7%), only 2.3% were Croats. The minimum numbers were respectively 4,160 and 97. More complete estimates were, respectively, 5,270 and 123 individuals.

Table 19. The Minimum and Estimated Overall Numbers of Wounded Persons According to the Ethnic Distribution

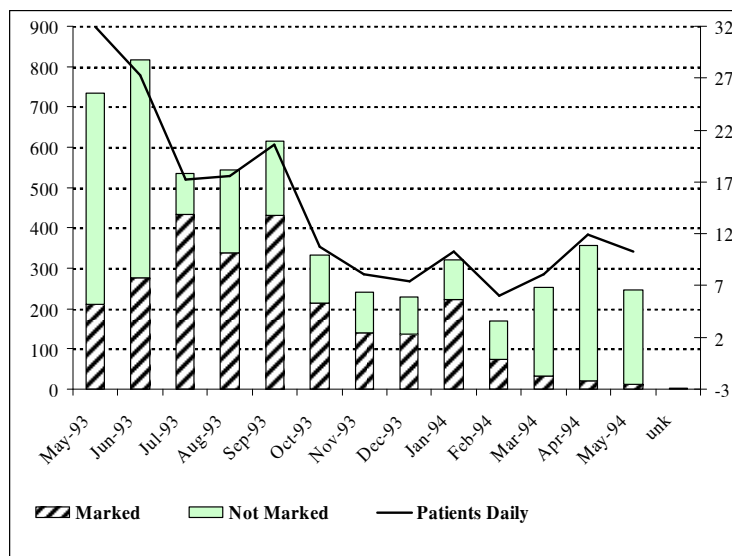
Ethnicity	Minimum (Observed)	Percent (Observed)	Estimated (Adjusted)	Percent (Adjusted)	Confidence Interval	
					Lower Limit	Upper Limit
Muslim	4,160	97.72	5,270	97.72	5,260	5,280
Croat	97	2.28	123	2.28	113	133
Unknown	1,136	na	na	na	na	na
Missing names/pages	474	na	na	na	na	na
Total	5,867	100.00	5,393	100.00	5,373	5,413

- Final statistics on timing are contained in Table 20 (by months) and Tables 21a and 21b (by day). A graphical presentation of timing is available from Figures 9 and 10 (a and b). The absolute numbers in these tables/charts are all observed, no adjustments were necessary as (almost) all dates are available from the Mostar Hospital Books, even for the illegible records (9) or for the records from missing pages (465). Tables 20 and 21 are compiled only for the well-defined records, however; thus excluding the illegible and missing pages records. These statistics should be, therefore, seen much more complete than the minimum numbers presented in all other tables in this section (comparable with the estimates).

Table 20. Timing of Arrivals at the Mostar War Hospital (By Month)

Month/Year	Count	Percent	Patients Daily
May-93	734	13.61	32
Jun-93	817	15.15	27
Jul-93	535	9.92	17
Aug-93	545	10.11	18
Sep-93	616	11.42	21
Oct-93	332	6.16	11
Nov-93	242	4.49	8
Dec-93	228	4.23	7
Jan-94	320	5.93	10
Feb-94	169	3.13	6
Mar-94	251	4.65	8
Apr-94	356	6.60	12
May-94	246	4.56	10
Unk	2	0.04	na
Total	5,393	100.00	na

Figure 9. Timing of Arrivals at the Mostar War Hospital (By Month)



Clearly, the first months of the siege were the most intensive and most harmful to the Mostar population. Fights in the months from May to September 1993 resulted in many more wounded persons than in any other of the remaining months of the siege. May and June were exceptional among these five months (734 and 817 wounded persons, respectively). Each day in May 1993 there arrived on average 32 patients at the War Hospital, and the daily average for June 1993 was 27 individuals. The lowest daily average is seen for February 1994 when the Washington agreement was signed.

Figure 10a. Timing of Arrivals at the Mostar War Hospital, 1993 (By Day)

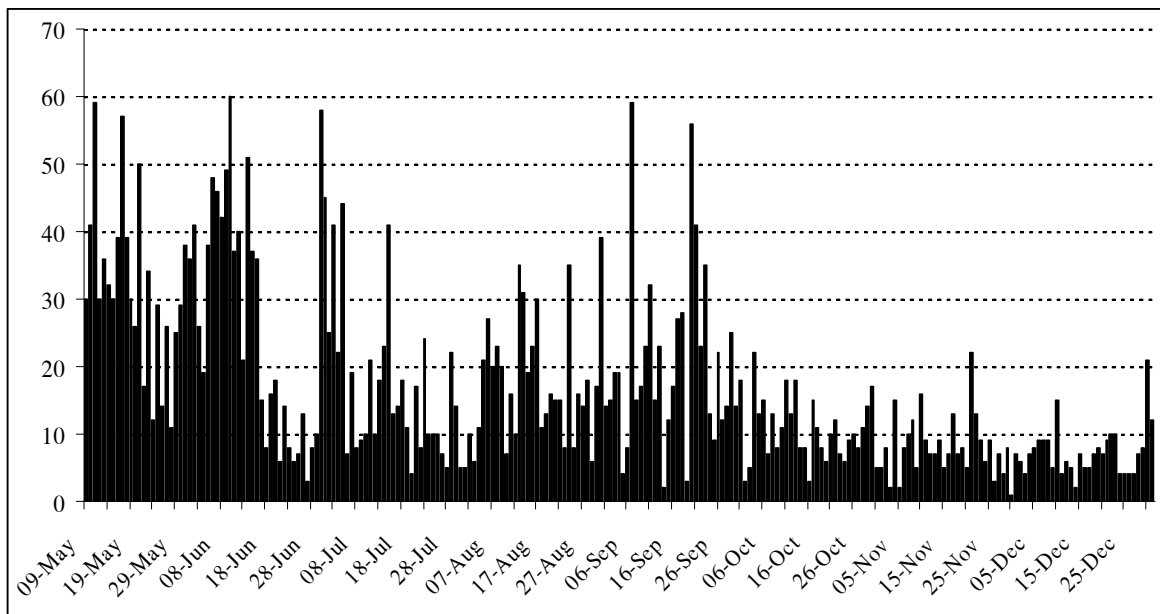
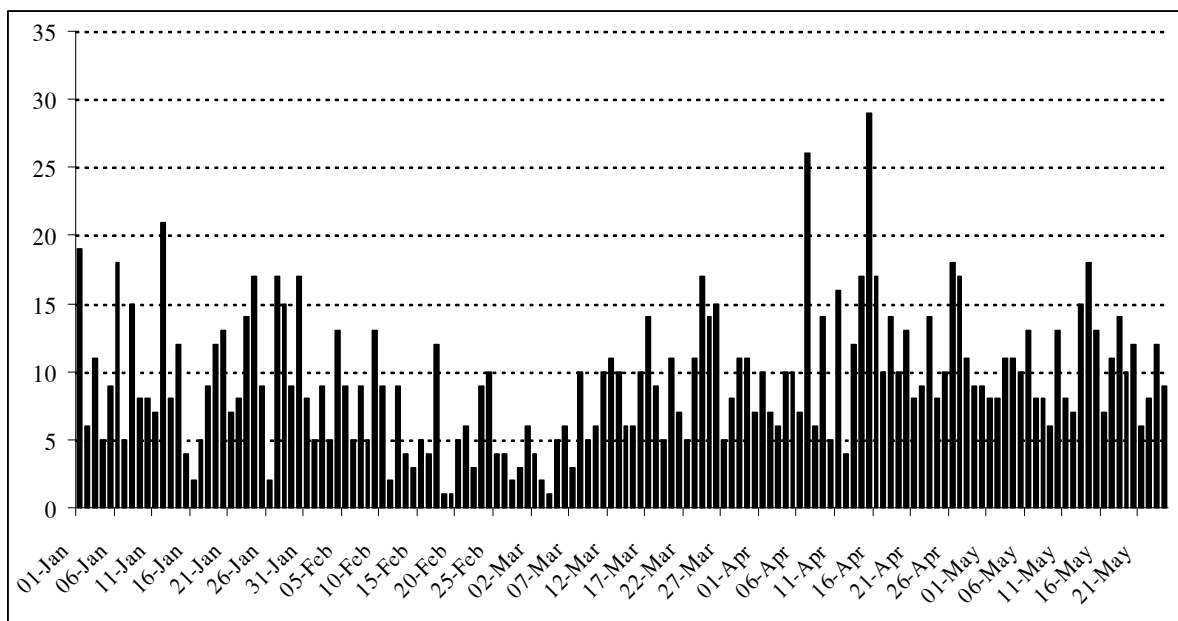


Figure 10b. Timing of Arrivals at the Mostar War Hospital, 1994 (By Day)



Figures 10a and 10b visualize the daily distribution of patients' arrivals at the War Hospital. These two charts are highly consistent with Figure 9, and in addition to that also indicate which days were characterized by high intensity of arrivals.

For May 1993, no days are observed with less than 10 arrivals a day. The lowest number of arrivals was on 28 May (11). Most days had from 20 to 29 arrivals, (10 days out of in total 23

studied here), and there were 4 days characterized by more than 40 arrivals (10, 11, 17 and 21 May 1993).

The situation in June was slightly different. 14 days in June 1993 had the number of arrivals lower than 20 a day, but there were also more days in June (than in May 1993) with extremely high numbers of arrivals. 9 days were characterized by more than 40 patients arriving at the hospital each day (2, 6-10, 12, 14, 30 June).

Specific dates in the period from 9 May 1993 to 24 May 1994 and the associated numbers of patients' arrivals on each day are reported in Tables 24a (for 1993) and 24b (for 1994) attached below. These two tables can be seen as a summary of the daily siege intensity, which every day brought new patients to the Mostar War Hospital.

Table 21(a) Timing (Daily): 1993

MyDay	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	0	36	45	5	14	18	5	7
02	0	41	25	10	15	3	8	6
03	0	26	41	6	19	5	2	4
04	0	19	22	11	19	22	15	7
05	0	38	44	21	4	13	2	8
06	0	48	7	27	8	15	8	9
07	0	46	19	20	59	7	10	9
08	0	42	8	23	15	13	12	9
09	30	49	9	20	17	8	5	5
10	41	60	10	7	23	11	16	15
11	59	37	21	16	32	18	9	4
12	30	40	10	10	15	13	7	6
13	36	21	18	35	23	18	7	5
14	32	51	23	31	2	8	9	2
15	30	37	41	19	12	8	5	7
16	39	36	13	23	17	3	7	5
17	57	15	14	30	27	15	13	5
18	39	8	18	11	28	11	7	7
19	30	16	11	13	3	8	8	8
20	26	18	4	16	56	6	5	7
21	50	6	17	15	41	10	22	9
22	17	14	8	15	23	12	13	10
23	34	8	24	8	35	7	9	10
24	12	6	10	35	13	6	6	4
25	29	7	10	8	9	9	9	4
26	14	13	10	16	22	10	3	4
27	26	3	7	14	12	8	7	4
28	11	8	5	18	14	11	4	7
29	25	10	22	6	25	14	8	8
30	29	58	14	17	14	17	1	21
31	38	0	5	39	0	5	0	12
Total	734	817	535	545	616	332	242	228

Table 21(b) Timing (Daily): 1994

MyDay	Jan	Feb	Mar	Apr	May	unk
unk						2
01	19	5	6	10	8	0
02	6	9	4	7	8	0
03	11	5	2	6	11	0
04	5	13	1	10	11	0
05	9	9	5	10	10	0
06	18	5	6	7	13	0
07	5	9	3	26	8	0
08	15	5	10	6	8	0
09	8	13	5	14	6	0
10	8	9	6	5	13	0
11	7	2	10	16	8	0
12	21	9	11	4	7	0
13	8	4	10	12	15	0
14	12	3	6	17	18	0
15	4	5	6	29	13	0
16	2	4	10	17	7	0
17	5	12	14	10	11	0
18	9	1	9	14	14	0
19	12	1	5	10	10	0
20	13	5	11	13	12	0
21	7	6	7	8	6	0
22	8	3	5	9	8	0
23	14	9	11	14	12	0
24	17	10	17	8	9	0
25	9	4	14	10	0	0
26	2	4	15	18	0	0
27	17	2	5	17	0	0
28	15	3	8	11	0	0
29	9	0	11	9	0	0
30	17	0	11	9	0	0
31	8	0	7	0	0	0
Total	320	169	251	356	246	0

After the five most intensive first months of the siege (May to September 1993), the intensity of fights obviously declined, the lowest being in February-March 1994 and second lowest in November-December 1993.

- The last table in this section, (Table 22), shows detailed locations of incidents that caused injuries of the patients treated in the War Hospital. Only locations characterized by 10 or more wounded persons are shown. Note that not all individuals listed at a given place were wounded in the same incident; sometimes several incidents occurred at the same location on different moments of time.

Table 22. Place of Incidents (Specific Location for Incidents with 10 or more Victims)

INCIDENT PLACE	Count	Percent
ZALIK	238	4.4
TEKIJA	172	3.2
BLAGAJ	167	3.1
ŠANTIĆEVA	118	2.2
CARINA	92	1.7
CERNICA	91	1.7
MAZOLJICE	64	1.2
RAZVITAK	63	1.2
B. POLJE	52	1.0
MAHALA	47	0.9
SDK	45	0.8
LUKA	26	0.5
VRAPČIĆI	26	0.5
"BEJRUT"	25	0.5
ŠHOVINA	24	0.4
BULEVAR	20	0.4
S. LOGOR	20	0.4
OPINE	20	0.4
RAŠTANI	18	0.3
STARI MOST	17	0.3
GNOJNICE	17	0.3
FEJIĆEVA	16	0.3
D. MAHALA	16	0.3
KOČINE	16	0.3
B. POLJE	15	0.3
BRANA	15	0.3
J. LOGOR	14	0.3
SJEVERNI LOGOR	13	0.2
Socijalno	12	0.2
POZORIŠTE	12	0.2
DUNAV	12	0.2
SJ. LOGOR	11	0.2
ŠANTIĆA	11	0.2
BIJELO POLJE	11	0.2
SUTINA	11	0.2
BRANKOVAC	10	0.2
S. LOGOR	10	0.2
ŠEMOVAC	10	0.2
REMAINING PLACES	493	9.1
UNKNOWN	3323	61.6
TOTAL	5393	100.0

The final conclusion of this report is that the siege of Mostar lasting between 9 May 1993 and 24 May 1994 resulted in high numbers of wounded persons (several thousands) and hundreds of killed persons. So the human consequences of the siege must be seen as very considerable.

ANNEX

- 1. RESULTS OF THE KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST**
- 2. ESTIMATING THE UNKNOWN OVERALL NUMBER OF WOUNDED PERSONS TREATED IN THE MOSTAR WAR HOSPITAL**

References

1. RESULTS OF THE KOLMOGOROV-SMIRNOV ONE-SAMPLE TEST

The description of the Kolmogorov-Smirnov one-sample test attached below is taken from Chapter 4.3, (pages 51 to 55), from Siegel and Castellan (1988).

The Kolmogorov-Smirnov one-sample test (hereafter K-S test) is a test of goodness-of-fit. The test is concerned with the degree of agreement between the distribution of a set of sample values (observed scores) and some specified theoretical distribution. It determines whether the scores in a sample can reasonably be thought to have come from a population having the theoretical distribution. Thus, the null hypothesis (H_0) is that the sample has been drawn from the specified theoretical distribution.

The test involves specifying the cumulative frequency distribution which would occur under the given theoretical distribution and comparing that with the observed cumulative frequency distribution. The theoretical distribution represents what would be expected under H_0 . The point at which these two distributions, theoretical and observed, show the greatest divergence is determined. Reference to the sampling distribution indicates whether such a large divergence is likely to occur on the basis of chance. That is the sampling distribution indicates the likelihood that a divergence of the observed magnitude would occur if the observations were really a random sample from the theoretical distribution. Critical values of the Kolmogorov-Smirnov test are used to determine the likelihood.

In our study of wounded persons reported in the Mostar War Hospital Books, we compare those patients for whom diagnosis is available (Marked as Wounded) with those for whom diagnosis is unavailable (Not Marked as Wounded). Patients with diagnosis are considered to represent the general population of wounded persons, thus their distributions (e.g. by sex or age) are seen as the theoretical distribution of all wounded persons. Patients without diagnosis are considered to be a sample and their distributions are seen as sample distributions.

Because the sex and age distribution of civilians and soldiers are considerably different, it only makes sense to apply the Kolmogorov-Smirnov test separately for civilians and soldiers. Another reason for applying this test to civilians and militaries is that these two groups are central in this report. Technically the test can be also applied to records reported as the unknown status but the results of this option are meaningless from the perspective of the two major groups investigated here (i.e. civilians and militaries).

Note as well that similarly to (status-specific) age and sex distributions of the WH patients also the timing-of-event distribution can be tested in exactly the same way. However, we argue in the main report (Section 5) that timing is affected (and severely so) by a very unevenly distributed underreporting of diagnosis which was most considerable in the first and last months of the conflict (May-June 1993 and March-May 1994). Moreover, we explained the reasons that caused this phenomenon. Therefore testing the agreement of these two distributions (timing among those Marked and Not Marked as Wounded) makes little sense. Nevertheless the results of testing the timing are included in this Annex as well.

The following variants of the K-S test have been completed and are included in this Annex:

- Variant 1. Sex distribution of civilians: Marked vs. Not Marked as Wounded (Tables A1 and A2)
- Variant 2. Sex distribution of militaries: Marked vs. Not Marked as Wounded (Tables A1 and A2)

- Variant 3. Age distribution of civilians: Marked vs. Not Marked as Wounded (Tables A3 and A4)
- Variant 4. Age distribution of militaries: Marked vs. Not Marked as Wounded (Tables A5 and A6)
- Variant 5. Age distribution of detainees: Marked vs. Not Marked as Wounded (Tables A7 and A8)
- Variant 6. Timing of arrival of civilians: Marked vs. Not Marked as Wounded (Tables A9 and A10)
- Variant 7. Timing of arrival of militaries: Marked vs. Not Marked as Wounded (Tables A11 and A12)
- Variant 8. Timing of arrival of detainees: Marked vs. Not Marked as Wounded (Tables A13 and A14)

The results of the test are included below in Tables A1 to A14.

The hypothesis tested (Ho) is the following:

Ho: The observed distribution of Marked as Wounded cases (by age or sex or timing-of-arrival) is the same as that of cases Not Marked as Wounded

The hypothesis is tested separately for civilians and militaries.

The decision regarding the Ho is **positive** for the age and sex distributions of civilians, militaries, and also detainees (variants 1, 2, 3, 4 and 5; Tables A2, A4, A6, and A8), i.e. there are no reasons to reject the hypothesis that the observed distribution of patients Not Marked as Wounded is **the same as** the theoretical distribution of patients Marked as Wounded. So, in every case the agreement of these two distributions has been statistically confirmed.

The decision regarding the Ho is **negative** for the timing-of-arrival distributions of civilians and militaries (variants 6, 7 and 8; Tables A10, A12 and A14), i.e. there are reasons to reject the hypothesis that the observed distribution of patients Not Marked as Wounded is **the same as** the theoretical distribution of patients Marked as Wounded. So, in every case the disagreement of these two distributions has been statistically confirmed.

Table A1. Observed Sex Distribution of Patients Marked and Not Marked as Wounded. Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit. Variants 1 (civilians) and 2 (militaries)

Category	Sex	Diagnosis		Total	Category	Sex	Diagnosis		Total
		No	Yes				No	Yes	
Civilians	Men	204	418	622	Civilians	Men	53.54	51.04	51.83
	Women	162	342	504		Women	42.52	41.76	42.00
	Unk/Unav	15	59	74		Unk/Unav	3.94	7.20	6.17
Militaries	Men	438	968	1,406	Militaries	Men	96.69	96.22	96.37
	Women	11	23	34		Women	2.43	2.29	2.33
	Unk/Unav	4	15	19		Unk/Unav	0.88	1.49	1.30
Unk Status	Men	1,436	536	1,972	Unk Status	Men	71.98	76.46	73.15
	Women	457	139	596		Women	22.91	19.83	22.11
	Unk/Unav	102	26	128		Unk/Unav	5.11	3.71	4.75
Detainees	Men	15	23	38	Detainees	Men	100.00	100.00	100.00
Total	All	2,844	2,549	5,393	Total	All	100.00	100.00	100.00

Table A2. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Sex Distribution of Patients Marked and Not Marked as Wounded. Variants 1 (civilians), and 2 (militaries)

Category	Sex	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
Civilians	Men	53.54	51.04	51.83	0.0251	0.0251				
	Women	96.06	92.80	93.83	0.0327	0.0327	381	0.01	0.0835	retain Ho
	Unk/Unav	100.00	100.00	100.00	0.0000	0.0000				
Militaries	Men	96.69	96.22	96.37	0.0047	0.0047				
	Women	99.12	98.51	98.70	0.0061	0.0061	453	0.01	0.0766	retain Ho
	Unk/Unav	100.00	100.00	100.00	0.0000	0.0000				
Unk Status	Men	71.98	76.46	73.15	-0.0448	0.0448	na	na	na	na
	Women	94.89	96.29	95.25	-0.0140	0.0140	na	na	na	na
	Unk/Unav	100.00	100.00	100.00	0.0000	0.0000	na	na	na	na
Detainees	Men	100.00	100.00	100.00	na	na	na	na	na	na
Total	All	100.00	100.00	100.00	na	na	na	na	na	na

Table A3. Observed Age Distribution of Patients Marked and Not Marked as Wounded. Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit. Variant 3: Civilians

Status	Age	Diagnosis		Total	Status	Age	Diagnosis		Total
		No	Yes				No	Yes	
Civilians	0-4	12	21	33	Civilians	0-4	3.15	2.56	2.75
	5-9	23	35	58		5-9	6.04	4.27	4.83
	10-14	33	69	102		10-14	8.66	8.42	8.50
	15-19	27	66	93		15-19	7.09	8.06	7.75
	20-24	11	44	55		20-24	2.89	5.37	4.58
	25-29	16	30	46		25-29	4.20	3.66	3.83
	30-34	24	57	81		30-34	6.30	6.96	6.75
	35-39	24	47	71		35-39	6.30	5.74	5.92
	40-44	22	66	88		40-44	5.77	8.06	7.33
	45-49	27	37	64		45-49	7.09	4.52	5.33
	50-54	20	54	74		50-54	5.25	6.59	6.17
	55-59	25	66	91		55-59	6.56	8.06	7.58
	60-64	33	63	96		60-64	8.66	7.69	8.00
	65+	39	85	124		65+	10.24	10.38	10.33
Unk	45	79	124	Unk	11.81	9.65	10.33		
Total	all	381	819	1,200	Total	all	100.00	100.00	100.00

Table A4. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age Distribution of Patients Marked and Not Marked as Wounded. Variant 3: Civilians

Status	Age	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
Civilians	0-4	3.15	2.56	2.75	0.0059	0.0059				
	5-9	9.19	6.84	7.58	0.0235	0.0235				
	10-14	17.85	15.26	16.08	0.0259	0.0259				
	15-19	24.93	23.32	23.83	0.0161	0.0161				
	20-24	27.82	28.69	28.42	-0.0087	0.0087				
	25-29	32.02	32.36	32.25	-0.0034	0.0034				
	30-34	38.32	39.32	39.00	-0.0100	0.0100				
	35-39	44.62	45.05	44.92	-0.0044	0.0044				
	40-44	50.39	53.11	52.25	-0.0272	0.0272				
	45-49	57.48	57.63	57.58	-0.0015	0.0015				
	50-54	62.73	64.22	63.75	-0.0150	0.0150				
	55-59	69.29	72.28	71.33	-0.0299	0.0299	381	0.01	0.0835	retain Ho
	60-64	77.95	79.98	79.33	-0.0202	0.0202				
	65+	88.19	90.35	89.67	-0.0217	0.0217				
Unk	100.00	100.00	100.00	0.0000	0.0000					
Total	all									

Table A5. Observed Age Distribution of Patients Marked and Not Marked as Wounded.
Used as Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit,
Variant 4: Militaries

Status	Age	Diagnosis		Total	Status	Age	Diagnosis		Total
		No	Yes				No	Yes	
Militaries	10-14	0	2	2	Militaries	10-14	0.00	0.20	0.14
	15-19	29	54	83		15-19	6.40	5.37	5.69
	20-24	81	192	273		20-24	17.88	19.09	18.71
	25-29	87	187	274		25-29	19.21	18.59	18.78
	30-34	64	182	246		30-34	14.13	18.09	16.86
	35-39	58	128	186		35-39	12.80	12.72	12.75
	40-44	49	101	150		40-44	10.82	10.04	10.28
	45-49	25	44	69		45-49	5.52	4.37	4.73
	50-54	15	29	44		50-54	3.31	2.88	3.02
	55-59	2	15	17		55-59	0.44	1.49	1.17
	60-64	1	4	5		60-64	0.22	0.40	0.34
	65+	0	1	1		65+	0.00	0.10	0.07
	Unk	42	67	109		Unk	9.27	6.66	7.47
Total	all	453	1,006	1,459	Total	all	100.00	100.00	100.00

Table A6. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age
Distributions of Patients Marked and Not Marked as Wounded.
Variant 4: Militaries

Status	Age	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
Militaries	10-14	0.00	0.20	0.14	-0.0020	0.0020				
	15-19	6.40	5.57	5.83	0.0084	0.0084				
	20-24	24.28	24.65	24.54	-0.0037	0.0037				
	25-29	43.49	43.24	43.32	0.0025	0.0025				
	30-34	57.62	61.33	60.18	-0.0372	0.0372	453	0.01	0.0766	retain Ho
	35-39	70.42	74.06	72.93	-0.0364	0.0364				
	40-44	81.24	84.10	83.21	-0.0286	0.0286				
	45-49	86.75	88.47	87.94	-0.0171	0.0171				
	50-54	90.07	91.35	90.95	-0.0129	0.0129				
	55-59	90.51	92.84	92.12	-0.0234	0.0234				
	60-64	90.73	93.24	92.46	-0.0251	0.0251				
	65+	90.73	93.34	92.53	-0.0261	0.0261				
	Unk	100.00	100.00	100.00	0.0000	0.0000				
Total	all									

Table A7. Observed Age Distribution of Patients Marked and Not Marked as Wounded.
Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit,
Variant 5: Detainees

Status	Age	Diagnosis		Total	Status	Age	Diagnosis		Total
		No	Yes				No	Yes	
Detainees	20-24	2	4	6	Detainees	20-24	13.33	17.39	15.79
	25-29	2	3	5		25-29	13.33	13.04	13.16
	30-34	4	2	6		30-34	26.67	8.70	15.79
	35-39	0	3	3		35-39	0.00	13.04	7.89
	40-44	1	4	5		40-44	6.67	17.39	13.16
	45-49	1	1	2		45-49	6.67	4.35	5.26
	50-54	1	3	4		50-54	6.67	13.04	10.53
	65+	1	0	1		65+	6.67	0.00	2.63
	Unk	3	3	6		Unk	20.00	13.04	15.79
Total	all	15	23	38	Total	all	100.00	100.00	100.00

Table A8. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age Distributions of Patients Marked and Not Marked as Wounded. Variant 5: Detainees

Status	Age	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
Detainees	20-24	13.33	17.39	15.79	-0.0406	0.0406				
	25-29	26.67	30.43	28.95	-0.0377	0.0377				
	30-34	53.33	39.13	44.74	0.1420	0.1420	15	0.01	0.4040	retain Ho
	35-39	53.33	52.17	52.63	0.0116	0.0116				
	40-44	60.00	69.57	65.79	-0.0957	0.0957				
	45-49	66.67	73.91	71.05	-0.0725	0.0725				
	50-54	73.33	86.96	81.58	-0.1362	0.1362				
	65+	80.00	86.96	84.21	-0.0696	0.0696				
	Unk	100.00	100.00	100.00	0.0000	0.0000				
Total	all									

Table A9. Observed Timing of Arrival at the War Hospital for Patients Marked and Not Marked as Wounded. Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit. Variant 6: Civilians

Year of Death	Status	Month of Death	Diagnosis		Total	Year of Death	Status	Month of Death	Diagnosis		Total
			No	Yes					No	Yes	
1993	civilians	05	2	2	4	1993	civilians	05	0.52	0.24	0.33
1993	civilians	06	6	58	64	1993	civilians	06	1.57	7.08	5.33
1993	civilians	07	38	148	186	1993	civilians	07	9.97	18.07	15.50
1993	civilians	08	100	164	264	1993	civilians	08	26.25	20.02	22.00
1993	civilians	09	69	180	249	1993	civilians	09	18.11	21.98	20.75
1993	civilians	10	52	83	135	1993	civilians	10	13.65	10.13	11.25
1993	civilians	11	20	49	69	1993	civilians	11	5.25	5.98	5.75
1993	civilians	12	12	33	45	1993	civilians	12	3.15	4.03	3.75
1994	civilians	01	24	75	99	1994	civilians	01	6.30	9.16	8.25
1994	civilians	02	24	24	48	1994	civilians	02	6.30	2.93	4.00
1994	civilians	03	21	3	24	1994	civilians	03	5.51	0.37	2.00
1994	civilians	04	13		13	1994	civilians	04	3.41	0.00	1.08
Total	civilians	All	381	819	1200	Total	civilians	All	100.00	100.00	100.00

Table A10. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age Distributions of Patients Marked and Not Marked as Wounded. Variant 6: Civilians

Status	Month of Death	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
civilians	05	0.52	0.24	0.33	0.0028	0.0028				
civilians	06	2.10	7.33	5.67	-0.0523	0.0523				
civilians	07	12.07	25.40	21.17	-0.1332	0.1332	381	0.01	0.0835	reject Ho
civilians	08	38.32	45.42	43.17	-0.0710	0.0710				
civilians	09	56.43	67.40	63.92	-0.1097	0.1097				
civilians	10	70.08	77.53	75.17	-0.0745	0.0745				
civilians	11	75.33	83.52	80.92	-0.0819	0.0819				
civilians	12	78.48	87.55	84.67	-0.0907	0.0907				
civilians	01	84.78	96.70	92.92	-0.1193	0.1193				
civilians	02	91.08	99.63	96.92	-0.0856	0.0856				
civilians	03	96.59	100.00	98.92	-0.0341	0.0341				
civilians	04	100.00	100.00	100.00	0.0000	0.0000				
civilians	All	-	-	-	-	-				

Table A11. Observed Timing of Arrival at the War Hospital for Patients Marked and Not Marked as Wounded. Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit. Variant 7: Militaries

Year of Death	Status	Month of Death	Diagnosis		Total	Year of Death	Status	Month of Death	Diagnosis		Total
			No	Yes					No	Yes	
1993	militaries	05	20	14	34	1993	militaries	05	4.42	1.39	2.33
1993	militaries	06	46	93	139	1993	militaries	06	10.15	9.24	9.53
1993	militaries	07	43	260	303	1993	militaries	07	9.49	25.84	20.77
1993	militaries	08	88	149	237	1993	militaries	08	19.43	14.81	16.24
1993	militaries	09	98	230	328	1993	militaries	09	21.63	22.86	22.48
1993	militaries	10	47	99	146	1993	militaries	10	10.38	9.84	10.01
1993	militaries	11	24	42	66	1993	militaries	11	5.30	4.17	4.52
1993	militaries	12	25	28	53	1993	militaries	12	5.52	2.78	3.63
1994	militaries	01	22	55	77	1994	militaries	01	4.86	5.47	5.28
1994	militaries	02	15	31	46	1994	militaries	02	3.31	3.08	3.15
1994	militaries	03	18	2	20	1994	militaries	03	3.97	0.20	1.37
1994	militaries	04	7	3	10	1994	militaries	04	1.55	0.30	0.69
Total	militaries	All	453	1006	1459	Total	militaries	All	100.00	100.00	100.00

Table A12. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age Distributions of Patients Marked and Not Marked as Wounded. Variant 7: Militaries

Status	Month of Death	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
militaries	05	4.42	1.39	2.33	0.0302	0.0302				
militaries	06	14.57	10.64	11.86	0.0393	0.0393				
militaries	07	24.06	36.48	32.63	-0.1242	0.1242	453	0.01	0.0766	reject Ho
militaries	08	43.49	51.29	48.87	-0.0780	0.0780				
militaries	09	65.12	74.16	71.35	-0.0903	0.0903				
militaries	10	75.50	84.00	81.36	-0.0850	0.0850				
militaries	11	80.79	88.17	85.88	-0.0738	0.0738				
militaries	12	86.31	90.95	89.51	-0.0464	0.0464				
militaries	01	91.17	96.42	94.79	-0.0525	0.0525				
militaries	02	94.48	99.50	97.94	-0.0502	0.0502				
militaries	03	98.45	99.70	99.31	-0.0125	0.0125				
militaries	04	100.00	100.00	100.00	0.0000	0.0000				
militaries	All	-	-	-	-	-				

Table A13. Observed Timing of Arrival at the War Hospital for Patients Marked and Not Marked as Wounded. Input Data for the Kolmogorov-Smirnov Test of Goodness-Of-Fit. Variant 8: Detainees

Year of Death	Status	Month of Death	Diagnosis		Total	Year of Death	Status	Month of Death	Diagnosis		Total
			No	Yes					No	Yes	
1993	detenees	07	3	4	7	1993	detenees	07	20.00	17.39	18.42
1993	detenees	08	9	12	21	1993	detenees	08	60.00	52.17	55.26
1993	detenees	09		5	5	1993	detenees	09	0.00	21.74	13.16
1993	detenees	10	1	1	2	1993	detenees	10	6.67	4.35	5.26
1993	detenees	11	1	1	2	1993	detenees	11	6.67	4.35	5.26
1993	detenees	12	1		1	1993	detenees	12	6.67	0.00	2.63
Total	detenees	All	15	23	38	Total	detenees	All	100.00	100.00	100.00

Table A14. Results of the Kolmogorov-Smirnov Test of Goodness-Of-Fit for Age Distributions of Patients Marked and Not Marked as Wounded. Variant 8: Detainees

Status	Month of Death	Cumulative Distribution		Total	Difference With-No	Abs Diff With-No	Sample Size (N)	Significance (Alfa)	Critical Value (Abs Diff)	Decision on Ho
		No Diagnosis	With Diagnosis							
detenees	07	20.00	17.39	18.42	0.0261	0.0261				
detenees	08	80.00	69.57	73.68	0.1043	0.1043				
detenees	09	80.00	91.30	86.84	-0.1130	0.1130	15	0.01	0.4040	reject Ho
detenees	10	86.67	95.65	92.11	-0.0899	0.0899				
detenees	11	93.33	100.00	97.37	-0.0667	0.0667				
detenees	12	100.00	100.00	100.00	0.0000	0.0000				
detenees	All	-	-	-	-	-				

2. ESTIMATING THE UNKNOWN OVERALL NUMBER OF WOUNDED PERSONS TREATED IN THE MOSTAR WAR HOSPITAL

The estimation method is explained here on the example of the variable Wound Type (i.e. cause of wounding) for patients registered with a specific diagnosis in relation to those registered without any diagnosis. The estimation method is based on the proportion (p) of patients reported under a given cause of wounding. The estimator of this proportion is obtained in our study from the scores of patients reported with a specific diagnosis available (comp Table 16, Section 6; see also Table A15 below).

Table A15. Adjustment of the Minimum Numbers of Wounded Persons According to the Observed Distribution of Wound Type (comp Table 16 Section 6)

Wound Type	Count	Percent	Count	Percent	Confidence Interval	
	(Observed)	(Observed)	(Adjusted)	(Adjusted)	Lower Limit	Upper Limit
Shelling	2,088	81.9	4,418	81.9	4,377	4,458
Gunshots	457	17.9	967	17.9	927	1,007
Shelling or Gunshots	3	0.1	6	0.1	3	10
Beaten	1	0.0	2	0.0	0	4
Unknown	2,844	na	na	na	na	na
Missing names/pages	474	na	na	na	na	na
Total	5,867	100.0	5,393	100	5,307	5,479

Three (non-zero) proportions were obtained from the observed sample of 2,549 patients with diagnosis available (i.e. with known causes of wounding): 81.3, 17.9 and 0.1 percent. We further assumed that the estimated proportions hold true for the entire (unknown) population of wounded persons. Based on the records from the War Hospital Books, another 2,844 additional persons should be included in the estimate of the overall total of the wounded. In the next step, we therefore applied these proportions to the sample of patients without a specific cause of wounding available (2,844; this total was multiplied by each of these three proportions). For example, $2,844 * 81.9\%$ resulted in an *additional* number of 2,330 victims of shelling. Together with the *observed* number of shelling victims (2,088), the overall total for shelling equals 4,418 individuals (2,088+2,330). We proceeded in this way in the case of this particular variable (i.e. cause of wounding) and also of all other variable discussed in Section 6 Final Results.

Table A15 also includes the confidence intervals associated with the estimated unknown overall numbers of wounded persons according to the cause of wounding. For victims of shelling, for example, the specific point estimate is 4,418 persons, with a 95% confidence interval from 4,377 to 4,458 individuals.

The same type of estimated overall numbers of wounded persons and the related confidence intervals are shown in Tables 17 and 19 in Section 6 for the wounded according to the status (civilians versus militaries) and ethnicity.

The theoretical basis for the above estimation procedures is summarized below:

$$\hat{p} = \frac{X}{n} - \text{Proportion of distinguished (X-value) elements in an n-element sample; an estimator of the unknown proportion } p \text{ of these elements in the entire population}$$

Statistic $\hat{p} = \frac{X}{n}$ has the binomial distribution with the mean $E(\hat{p}) = p$ and standard deviation $D(\hat{p}) = \sqrt{\frac{p(1-p)}{n}}$. For big samples, the statistic $\hat{p} = \frac{X}{n}$ is approximated by the normal distribution with the same parameters.

The confidence interval for statistic $\hat{p} = \frac{X}{n}$ can be therefore estimated using the following formula:

$$P\left(\hat{p} - u_{\alpha} \sqrt{\frac{p(1-p)}{n}} < p < \hat{p} + u_{\alpha} \sqrt{\frac{p(1-p)}{n}}\right) \cong 1 - \alpha$$

Based on the above formula and the fact that the number of distinguished elements can be obtained from the proportion equation $\hat{p} = \frac{X}{n}$ as: $X = \hat{p} n$, the formula of the confidence interval for X can be easily derived from that for \hat{p} :

$$P\left(n \hat{p} - u_{\alpha} \sqrt{np(1-p)} < X < n \hat{p} + u_{\alpha} \sqrt{np(1-p)}\right) \cong 1 - \alpha$$

■

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