



## Quantitative analysis of victim demographics and injury characteristics at a metropolitan Medico-Legal Center

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### ABSTRACT

For the timeframe of February 1st, 2003 until December 31st, 2005, all forensic medical experts at the Medico-Legal Center of the Institute of Legal Medicine in Hamburg, Germany, completed a standardized questionnaire for every consenting surviving violence victim ( $n=2733$ ) age 14 and older. Central to the quantitative analysis of the data collected was the extraction of specific injury characteristics from the sample population. A correlation was demonstrated between injury typologies and four possible perpetrator–victim constellations, each of which was subcategorized into sexual and non-sexual assaults.

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### 1. Introduction

In Germany, the assessment and documentation of all injuries a victim sustains as a result of violence, as well as the proper securing of forensic evidence and expert testimony in a court of law, have long been essential and grounded components of legal medicine. These components are integral parts of the duties of German experts in forensic medicine. Standard procedures or protocols for the collection and documentation of evidence have been well established in the literature and can be found in clinical forensic medicine textbooks and journals [1,2].

Generally, law enforcement officers will introduce victims to forensic medical expert as part of their investigative work. In Germany, law enforcement often requests experts in forensic medicine to complete the evidence collection in cases of aggravated assault and other violent crimes. Victims of interpersonal violence, however, are less regularly the recipients of such services. Therefore, in 1998, the Hamburg Institute of Legal Medicine established the Medico-Legal Center for victims of violence to improve the forensic response for all victims of violent crimes.

The Center functions as a first resource of medico-legal care for the victims. Services are available 24 h, 7 days per week, at no cost and are offered regardless whether police charges have been filed. As part of the service, forensic medical experts conduct a physical

exam that entails the assessment, as well as the written and photographic documentation of any injuries, in addition to the securing and storing of any trace evidence found on the victims. At the conclusion of each exam, the victim receives contact information and referrals to psychological as well as medical agencies that provide follow-up victim advocate services that are located within the community. Funding for the Center is provided by the Hamburg Office of Social Welfare and through private donations. Additionally, several experts in forensic medicine volunteer their services to provide the Center with around the clock staff coverage.

Central to the quantitative analysis of the data collected was the extraction of specific injury characteristics from our sample population, a pool of diverse and voluntarily presenting victims of violent crimes. A correlation was demonstrated between injury typologies and four possible perpetrator–victim constellations, each of which was subcategorized into sexual and non-sexual, yet physical assaults.

### 2. Methods

#### 2.1. Selection criteria

For the timeframe of February 1st, 2003 until December 31st, 2005, all forensic medical experts on duty completed a standardized questionnaire for every consenting victim ( $n=2733$ ) presenting at the Center age 14 and older. The interview was completed in addition to all other forensic documentation and examined the following variables: basic demographics of victim, person or agency filing report, history of event, form of violence, possible substance abuse by victim and/or perpetrator, objective assessment of injuries, consistency or non-consis-

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**Table 1**  
Victim–perpetrator constellation categories.

Intimate partner violence	
Group A1	Perpetrator is current or ex-partner, current or ex-husband/wife, current or ex-intimate partner Exclusion: sexual assault or abuse
Group A2	Perpetrator is current or (ex)-partner, current or ex-husband/wife, current or ex-intimate partner Inclusive of nonconsensual sexual activity (assault or abuse)
Interpersonal violence	
Group B1	Perpetrator is family member, work colleague, acquaintance, class mate, neighbor Exclusion: sexual assault or abuse
Group B2	Perpetrator is family member, work colleague, acquaintance, class mate, neighbor Inclusive of nonconsensual sexual activity (assault or abuse)
Stranger violence	
Group C1	Violent conflicts occurring in discos, bars, traffic, on the street, between strangers
Group C2	Sexual assault or abuse against adults perpetrated by strangers
Group C3	Robbery
Miscellaneous violent crimes	
Group D	Perpetrator and motive for violent crime unknown due to victim being unconscious or incoherent at time of exam

tency with history, documentation of additional services provided (e.g. trace evidence recovery) and if indicated, services provided by cooperating partners such as medical or psychological specialists. The sample group was divided into four major victim/perpetrator constellations (v/p) (see Table 1), subcategorized into sexual and non-sexual assaults and then, examined separately for each variable.

2.2. Study design

After the completion of a plausibility control test with logically correlated variables, all data collected by means of the standardized questionnaire was checked, coded, entered, and analyzed using the statistical software SPSS 10.0 [3]. Group differences were examined using categorical and ordinal scaled data sets and

compared by the ANOVA and the  $\chi^2$ -test ( $p < 0.05$ ). This study was approved by the Hamburg Office for Privacy and Portability of Data.

3. Results

Between February 1st, 2003 and December 31st, 2005, a total of 3074 victims of violent crime were examined at the Medico-Legal Competence Center housed at the Hamburg Institute of Legal Medicine. A standardized questionnaire was completed for 2733 victims (88.9%) 14 years and older. Of these victims, 1700 (62%) were females and 1033 (38%) males (see Fig. 1).

A large number of women ( $n = 686$ , 93.6%, Group A1) in addition to 47 males (6.4%, Group A1) reported having been the victim of intimate partner violence by their current or ex-partner. Overall, 249 (45.4%) women and 299 men (54.6%) stated that they had suffered from interpersonal violence (Group B1) (see Table 2).

The majority of male victims ( $n = 429$ , 75.1%, Group C1) reported having been physically assaulted by a stranger as did 142 females (24.9%). 53 males (14.8%, Group C3) and 63 females (29.2%) reported a physical assault during a robbery.

The victims' ages were categorized by means of 5-year intervals. The peak age group for women to become victims of violent crimes was calculated to be that of 15–19-year olds and for men, 20–24-year olds.

Most victims examined at the Center were German citizens (77.8%). Group A1, representing victims of intimate partner-perpetrated physical assaults, consisted of the largest non-German population (33.1%). In February of 2003, approximately 1.73 M individuals were registered citizens of the city–state of Hamburg, of which 254,745 individuals (14.7%) however, did not possess German citizenship [4]. This specialized group of migrant or non-German individuals was overrepresented within our sample group. Nonetheless, our data in regard to citizenship and violent occurrences among migrant or non-German individuals may not comprehensively reflect this situation and needs further exploration.

3.1. Timeframe for evidence collection

In stranger-perpetrated sexual assault cases (Group C2), the trace evidence collection was significantly more often completed

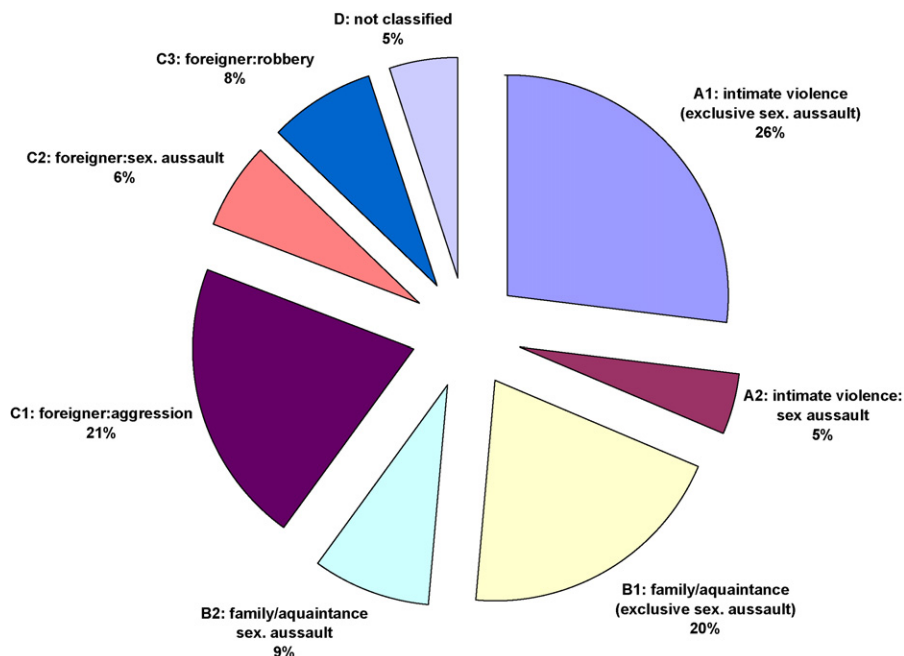


Fig. 1. Classification of victim–perpetrator relationship.

**Table 2**  
Characteristics of victim–perpetrator constellations.

Category	Total n	Female n/%	Male n/%	Age (mean/S.D.)	Nationality (German %)	Time period until examination (days; mean/S.D.) <sup>a</sup>	Weekend (%) <sup>b</sup>
A1: intimate violence	733	686 93.6%	47 6.4%	35.0 <sup>***</sup> /11.2	66.9 <sup>***</sup>	2.05/2.80	19.6/44.9
A2: intimate violence:sa	123	122 99.2%	1 0.8%	32.7/12.0	71.1	1.77/3.71	30.1/43.1
B1: family/acquaintance	548	249 45.4%	299 54.6%	33.0/16.9	72.3	2.19/3.14	18.4/38.4
B2: family/acquaintance:sa	234	227 97.0%	7 3.0%	25.0/10.9	87.1	1.43/4.58	46.2/52.9
C1: foreigner:aggression	571	142 24.9%	429 75.1%	31.5/11.9	72.0	2.04/3.02	22.6/52.7
C2: foreigner:sa	171	167 97.7%	4 2.3%	29.8/13.0	78.3	0.75/1.09	40.4/54.3
C3: foreigner:robbery	216	63 29.2%	153 70.8%	36.5/16.7	81.0	2.12/3.24	14.8/40.4
D: not classified	137	44 32.1%	93 67.9%	38.8/17.3	71.1	2.19/3.35	22.6/53.5
Total	2733	1700 62.2%	1033 37.8%	32.9/14.0	77.8	1.94/3.16	23.8/46.5

<sup>a</sup> Analysis restricted to cases with the exam being conducted maximally 1 month post-assault (elimination of outliers).

<sup>b</sup> Weekend from Fridays 6 p.m. until Mondays 6 a.m.; day of exam/day of assault.

<sup>\*\*\*</sup> Significant difference to other groups.

within 24–48 h ( $p < .01$ ) than those of the other groups. In cases of interpersonal violence with a concurrent sexual assault or abuse (Group B2) evidence was collected on an average of 1.43 days post-assault. Generally, trace evidence that could be obtained from victims of physical and sexual assault or abuse perpetrated by their intimate partner (Group A2) was obtained at a slightly later point in time.

### 3.2. Substance abuse

Of the total number of victims, who at the time of their attack were under the influence of alcohol, 189 (23.7%) victims were significantly more often assaulted by a stranger (Group C1,  $p < .001$  in group comparisons), 140 (17.6%, Group A1) reported having been subjected to intimate partner violence, 128 (16.1%, Group B2) were victims of sexual assault/abuse perpetrated as part of interpersonal violence, and 100 individuals (12.6%, Group B1) reported interpersonal violence without any sexual assault/abuse. The remaining number (30%) of acutely alcohol intoxicated victims was evenly distributed amongst the following Groups: A2 (intimate partner violence with concurrent sexual assault/abuse), C2 (stranger-rape), and C3 (robbery), D (miscellaneous).

From all the victims who reported to be under the influence of alcohol at the time of attack, blood samples were examined in 67 victims. The samples were taken between 3, 5 and 17 h after assault. By 31 victims breath alcohol concentration was measured. This happened between 1 and 7 h after assault.

In addition, 24 victims (27%, Group B2) of sexual assault or abuse as part of interpersonal violence were under the influence of illegal substances. Similar results were obtained for the number of victims of stranger-perpetrated sexual assaults ( $n = 21$ , 23.6%, Group C2). At the time of the offense, another 13 victims of sexual assault/abuse perpetrated as part of interpersonal violence (23.6%, Group B2) were under the influence of prescription medications.

Toxicological analysis was performed in 45 cases. In 13 cases only blood samples were examined, in 5 cases only urine samples and in 27 cases blood and urine samples were examined. The time period between sample collection and assault was between 3, 5 and 48 h.

### 3.3. Cause of injury

Physical violence (76.6%) was reported as the most common source of injury and occurred significantly more often among victims of intimate partner violence (81.6%, Group A1) than all

other groups (62.5%,  $p < .001$ ). The combination of physical violence perpetrated with an instrument or object was reported significantly less often (15.9%). However, this combination was reported primarily as having been experienced during a robbery (30.6%, Group C3). Violence perpetrated exclusively with an object (6.6%) was found to have occurred most often during stranger-perpetrated physical assaults (11.2%, Group C1) and during episodes of interpersonal violence (8.4%, Group B1).

### 3.4. Blunt force trauma

Victims who suffered blunt trauma had following type of injuries: patterned bruises, diffuse bruises, lacerations, abrasions and fractures.

### 3.5. Neck

Overall, 28.9% of victims of intimate partner violence (Group A1) and 28.5% of victims of sexual assault or abuse resulting from intimate partner violence (Group A2) reported having suffered blunt force trauma to the neck. Significantly less victims of sexual assault or abuse resulting from interpersonal violence (15%,  $p < .001$ , Group B2), interpersonal violence (13%, Group B1) and stranger-perpetrated sexual assault (12.1%, Group C2) reported having sustained blunt force trauma to this region. In far the most cases blunt trauma to the neck was due to manual strangulation, seldom combined with arm locks. In 25 cases the victims were strangulated by ligature.

In 14.2% of intimate partner violence cases (Group A1), the treating forensic medical expert was able to affirm that injuries to the victim's neck were consistent with the victim's stated history of events. Consistent physical evidence of blunt force trauma to the neck could further be identified in 11.5% of victims of interpersonal violence (Group B1), in 11.1% of victims of sexual assault or abuse resulting from interpersonal violence (Group B2), and in 9.5% of victims of stranger-perpetrated sexual assaults (Group C2) (see Table 3).

### 3.6. Face

Victims of intimate partner violence (52.8%, Group A1) and interpersonal violence (50.5%, Group B1) reported a high rate of blunt force trauma to the face. This injury typography was reported significantly more often among groups that did not report a sexual assault or abuse as part of the violent offense (25.2%, Group A2; 15.4%, Group B2;  $p < .001$ ). Nonetheless, victims of robberies

**Table 3**  
Blunt force trauma: injury patterns for specific victim–perpetrator constellations.

Category	Head	Face	Cranium	Neck	Head and neck	Back	Upper limbs	Lower limbs
A1: intimate violence	<b>57.8</b>	<b>52.8%</b>	16.0%	<b>14.2%</b>	<b>9.0%</b>	<b>17.2</b>	<b>52.9%</b>	<b>35.5%</b>
A2: intimate violence:sa	27.6	25.2%	8.1%	9.8%	4.1%	11.4	<b>44.7%</b>	<b>42.3%</b>
B1: family/acquaintance	<b>57.8</b>	50.5%	<b>19.3%</b>	<b>11.5%</b>	<b>8.0%</b>	11.1	<b>37.8%</b>	23.0%
B2: family/aquaintance:sa	17.1	15.4%	3.8%	<b>11.1%</b>	3.4%	11.1	28.2%	23.9%
C1: foreigner:aggression	57.3	<b>51.7%</b>	15.1%	4.9%	3.5%	8.4	32.0%	23.5%
C2: foreigner:sa	25.7	21.6%	5.8%	9.4%	4.1%	<b>11.7</b>	26.9%	26.9%
C3: foreigner:robbery	<b>64.8</b>	<b>56.0%</b>	<b>22.7%</b>	8.8%	<b>6.5%</b>	8.8	33.8%	21.3%
D: not classified	52.6	41.6%	<b>28.5%</b>	5.8%	3.6%	<b>17.2</b>	36.5%	<b>32.8%</b>

Head = face and/or cranium. Three most frequent categories for each group are in bold print.

reported the highest rate of blunt force trauma to the face (56.0%, Group C3).

3.7. Head

Blunt force trauma to the cranium was reported by 19.3% of victims of interpersonal violence (Group B1), as well as by 15.1% of victims of stranger-perpetrated physical assaults (Group C1). However, this type of trauma was recounted by only 5.8% of victims of stranger-perpetrated sexual assaults (Group C2) and 3.8% of victim’s sexual assault or abuse resulting from interpersonal violence (Group B2).

3.8. Back

The results of our analysis indicate that blunt force trauma to the back was most often noted amongst victims of intimate partner violence (17.2%, Group A1).

3.9. Extremities

Blunt force trauma to the upper extremities, such as actively and passively acquired defensive wounds or injuries resulting from being held down or manually fixated, was most often reported by victims of intimate partner violence (52.9%, Group A1) and victims of sexual assault or abuse resulting from intimate partner violence (44.7%, Group A2).

Victims of sexual assault or abuse resulting from interpersonal violence (28.2%, Group B2) and victims of stranger-perpetrated sexual assaults (26.9%, Group C2) reported injuries of their upper extremities significantly less often than Groups A1 and A2.

3.10. Absence of injuries

Forensic medical experts documented an absence of injuries significantly more often for victims of sexual assault or abuse resulting from interpersonal violence (48.3%,  $p < .01$ , Group B2) than for all other groups, specifically victims of stranger-perpetrated sexual assaults ( $p < .05$ ) and intimate partner violence ( $p < .01$ ).

3.11. Injured body regions

Victims of intimate partner violence (Group A1) sustained injuries to significantly more body regions than victims of all other categories ( $p < .001$ ) and were more likely to suffer from potentially life-threatening injuries as a result (12%, Group A1) than victims of stranger-perpetrated physical assaults (11.9%, Group C1) and victims of interpersonal violence (11.7%, Group B1). However, acute life-threatening injuries were noted more often amongst victims of stranger-perpetrated physical assaults (4.6%, Group C1), intimate partner violence (2.9%, Group A1), and interpersonal violence (2.9%, Group B1).

In addition, victims of sexual assault or abuse resulting from intimate partner violence ( $p < .01$ , Group A2) reported injuries to significantly more body regions than victims of stranger-perpetrated sexual assault or abuse (see Fig. 2).

3.12. Self-inflicted injuries

Overall, 2.5% of the total number of victims ( $n = 2733$ ) seen at the Center, i.e. 47 women and 4 men, presented with self-inflicted injuries.

3.13. Evaluation of allegations

Our results indicate that in 90.2% of cases of intimate partner violence (Group A1), 85.3% of stranger-perpetrated physical assaults (Group C1), 85.6% of robberies (Group C3), and 81.9%

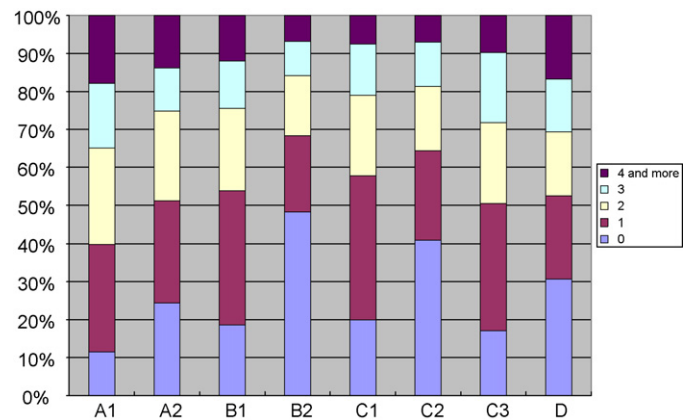


Fig. 2. Number of injured body regions according to victim–perpetrator constellation.

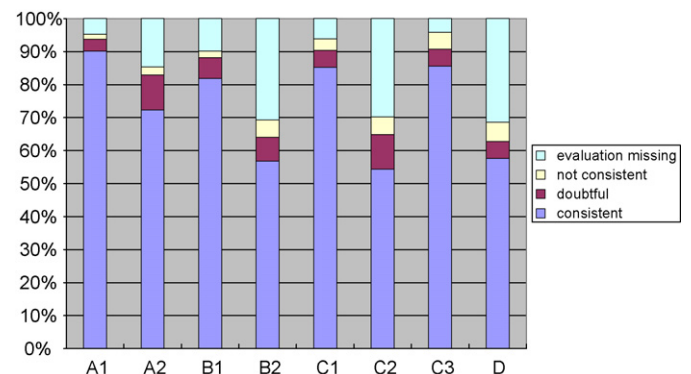


Fig. 3. Injuries consistent or non-consistent with victim’s stated history of events.

cases of interpersonal violence (Group B1), the injuries were found to be consistent with the victim's reported history of events. However, the objective evaluation of injuries effectuated by a sexual assault or abuse proved to be difficult. These injuries were statistically less often consistent with the victim's stated history of events, specifically for victims of sexual assault or abuse as part of intimate partner violence (72.4%, Group A2), interpersonal violence (56.8%, Group B2), and stranger-perpetrated sexual assaults (54.5%, Group C2) (see Fig. 3).

#### 4. Discussion

When interpreting these statistical results, one must keep in mind that visibly noticeable injuries sustained as a result of violent offenses often function as a prerequisite for obtaining medico-legal care in Germany. Hence, the results of this study may not provide adequate insight into the true extent and epidemiology of the perpetrator-victim constellation and the prevalence of violence. However, our results and analysis may allow for a comparison of injury patterns typically associated with specific violent crimes. The results we obtained at the Medico-Legal Center match those of other research conducted worldwide, predominantly in Anglo-American regions [5,6]. Specifically, women appear to be at a significantly higher risk of being victimized by their intimate partner or ex-partner than men are. It has been reported that the risk of victimization by their partner increases for men if they live in a same-sex relationship [7]. In accordance with other research [8], we found that men are by far more often the victim of stranger-perpetrated physical assaults than any other violent crime.

When law enforcement or the victims themselves call the Center to schedule an appointment for a forensic exam, they are made acutely aware of the need for the exam to be conducted as close in time to the actual offense as possible. The question of causality and consistency of injuries correlating with the victim's stated history of events will become more difficult as evidence is lost over time. Victims of sexual assault or abuse resulting from interpersonal violence and victims of sexual assault or abuse resulting from intimate partner violence ( $n = 6$  and  $n = 7$ , Groups B2 and A2, respectively) were more likely to call the Center for an appointment 4 or more weeks after the assault occurred than victims of stranger-perpetrated sexual assault or abuse ( $n = 1$ , Group C2) who made an appointment within 24–48 h of the offense. A contributing factor to the late reporting may be the closely controlled home environment victims of intimate partner and interpersonal violence live in. According to the cycle of domestic violence, the perpetrator often controls, threatens, and shames his/her victim into silence and repeats his violent behavior in an escalating manner. Hence, the opportunity for victims to have their injuries examined and documented without having to file charges and inform law enforcement and thus, risking more brutal attacks by the perpetrator, remains an incredibly important aspect to consider in the medico-legal care for victims of intimate partner and interpersonal violence.

In this context, a large number of victims reported abusing illegal substances, alcohol, or prescription medications at the time of the offense. Further research must be conducted to help determine if the self-reported substance abuse by the victim may be regarded as a chronic substance abuse problem and hence, may function as an alternative form of "relief" from psychological and/or physical distress as part of the sequelae of a long-term, abusive relationship [9]. Victims who were intoxicated at the time of the offense reported injuries to significantly less body regions than nonintoxicated victims.

The highest prevalence of physical force used during an attack was noted to occur as part of intimate partner violence rather than

interpersonal violence or stranger-perpetrated physical assaults. Walby and Allen [6] as well as Tjaden and Thoennes [7] observed a similar phenomenon. A majority of women, as well as men, reported that slapping across the face, hitting, and shoving was the primary type of violent behavior that they experienced by their intimate partner or ex-partner.

The use of instruments or objects in combination with some form of physical violence was most often reported by victims of stranger-perpetrated physical assaults, specifically robberies. This powerful combination of using an object along with physical violence is often used with the intention of instilling in the victim a maximum amount of fear and compliance in the shortest amount of time possible.

Although 28.9% of victims of intimate partner violence (Group A1) and 28.5% of victims of sexual assaults and abuse resulting from intimate partner violence (Group A2) reported blunt force trauma to the neck, forensic medical experts were able to affirm injuries consistent with such reports in only 14.5% and 9.8% of victims, respectively. Assuming all victims truthfully recounted their experience, these results emphasize the difficulty often encountered when objectively determining the consistency of such injuries with the victim's stated history of events. This evidentiary challenge is further complicated by victims (approximately 60–70%, Groups A1 and B1) who do not report within the first 24 h post-assault. Generally, victims of stranger-perpetrated sexual assaults reported within this limited timeframe and for the most part, little to no discrepancies could be found between the victims' injuries and the stated history. To improve the objectivity and diagnosis, the victims can be examined using MRI techniques. Yen et al. showed that subcutaneous hemorrhage can be demonstrated even when there was no corresponding externally visible bruise or abrasion [10].

Our results indicate that approximately 50% of victims of intimate partner, interpersonal, and stranger-perpetrated violence sustained blunt force trauma to their face. A review of scientific literature reiterated the fact that the face appears to be the most commonly injured body region among victims of intimate partner violence [11–13]. In addition, our results also pointed toward an increased rate of facial injuries incurred by victims of robberies or violent property crimes (e.g. theft).

Nonetheless, blunt force trauma of the upper extremities may also be used as an indicator for intimate partner violence. We noted a significantly higher prevalence of injuries to the upper extremities among victims of intimate partner violence (with and without a sexual assault or abuse allegation.) Here, defensive wounds may be related to the astute victim being manually fixated and actively fighting off the offender. The significantly greater prevalence of this type of trauma amongst victims of intimate partner violence may be the result of the victim anticipating the perpetrator's violent actions, as they are often repetitive and predictable in nature.

The objective evaluation by the forensic medical expert of the sexually assaulted or abused victims' injuries remains difficult. These victims generally present with less physical injuries than victims of the other groups, specifically non-sexual violent offenses. Hence, the expert in forensic medicine was often left with little to no physical evidence to base his or her evaluation on. We would like to comment that our experience leads us to assume that sexual assault or abuse based crimes often start off as mutual intimacy during which one party is then forced to participate in unwanted sexual activities and may have even consumed a mood altering substance, such as alcohol. The analysis of relevant trace evidence, e.g. biological evidence or DNA, is completed at the State Crime lab and was therefore not considered for this report. We often do not receive feedback if the evidence we recovered was in fact, positive for DNA. In only a limited number of cases could a

positive identification of sperm in situ contribute to the non-ambiguity of the case.

In conclusion, we would like to reemphasize that intimate partner violence produces a characteristic injury pattern in the victim, specifically blunt force trauma to the head and neck, as well as to the upper and lower extremities. In comparison to all other perpetrator–victim constellations, victims of intimate partner violence reported injuries to significantly more body regions and experienced more severe injuries than victims in all other groups. In addition, those injuries that these victims sustained were more often potentially life-threatening.

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