# INVESTIGATOR BELIEFS OF HOMICIDE CRIME SCENE CHARACTERISTICS

**Joshua J. Reynolds**
**Victoria Estrada-Reynolds**
**Stockton University**

**Scott Freng**
**Sean M. McCrea**
**University of Wyoming**

Homicide investigators rely on a plethora of sources to solve a case, including their own beliefs and intuitions. We discuss a variety of these beliefs and explore their veracity using a novel approach, coding cases from the documentary television show, *Forensic Files*. Our results indicate that most of these beliefs are unsupported. However, some beliefs may be predictive. Specifically, a body that was wrapped or placed in a container was indicative that the body had been transported. In addition, finding the victim nude was predictive of rape. We discuss the problems of following inaccurate beliefs, and the potential use of the accurate beliefs we identified.

*Keywords*: homicide beliefs, intuition, crime scene, profiling

During a criminal investigation, such as a homicide, investigators are given the enormous task of piecing together evidence to solve the crime. To do this, investigators must rely on multiple sources of knowledge, such as eyewitnesses, forensic evidence, and often their own beliefs and intuition about the crime scene and potential suspects. However, research on the accuracy of these sources indicates potential problems. For example, research has shown that eyewitness memory is malleable, fallible, and generally not as strong as the average person believes (Blank & Launay, 2014; Deffenbacher, Bornstein, Penrod, & McGorty, 2004; Loftus, 2005). Even forensic evidence such as fingerprints, long believed to be extremely reliable, have now been shown to be problematic (Dror, Charlton, & Péron, 2006; Dror, Péron, Hind, & Charlton, 2005; National Research Council, 2009). There has also been some research on the validity of investigator beliefs and intuition regarding observable case facts. For example, research has focused on police beliefs concerning victim and witness emotionality, as well as police beliefs regarding their own ability to detect deception (Ask, 2010; DePaulo & Pfeifer, 1986; Kleider-Offutt, Cavrak, & Knuycky, 2015; Vrij & Mann, 2001). Evidence suggests that police are overconfident in their ability to detect deception and falsely believe that liars display certain behavioral cues indicating their deceit (Aamodt, 2008; Aamodt & Custer, 2006).

**Author Note:** Joshua J. Reynolds, Joshua.reynolds@stockton.edu, Stockton University, Galloway, NJ, USA; Victoria Estrada-Reynolds, Victoria.Estrada-Reynolds@stockton.edu, Stockton University, Galloway, NJ, USA; Scott Freng, sfreng@uwyo.edu, University of Wyoming, Laramie, WY, USA; Sean M. McCrea, smccrea@uwyo.edu, University of Wyoming, Laramie, WY, USA

Despite evidence that some police officer intuitions and beliefs are unsubstantiated, we should be careful not to automatically discount belief and intuition, as there may be times when they are more accurate than chance. The purpose of this research was to explore the veracity of several beliefs regarding the relationship between aspects of the crime scene and actual victim-perpetrator relationships. Herein, we discuss various crime scene beliefs and use a novel approach to investigate their veracity.

## CRIME SCENE BELIEFS

Commonly mentioned among homicide investigators are beliefs about how aspects of the crime scene and state of the body might provide information regarding the relationship of the victim to the perpetrator (Douglas, Burgess, Burgess, & Ressler, 2013). For example, some homicide investigators believe that evidence of overkill suggests that the victim knew the perpetrator. Similarly, if the deceased was found nude or partially nude, then it is suspected that the victim has been sexually assaulted (Meshram & Nanandkar, 2013). Further, there is evidence that homicide investigators draw upon crime scene inferences, such as victim-perpetrator information, when examining a crime scene. At least sometimes, those inferences are accurate (Wright, 2013). The origin of these beliefs is not always clear, as some may reflect common ideas that exist amongst most people, whereas other beliefs may have been instilled through formal law enforcement training. Perhaps the most formal version of crime scene and victim-perpetrator beliefs comes in the form of criminal profiling or criminal investigative analysis.

In criminal investigative analysis, the investigator reviews information from the crime and crime scene to create a profile of the perpetrator. Although there is still much empirical work to be done on profiling, the evidence that does exist casts serious doubt as to its effectiveness (Snook, Cullen, Bennell, Taylor, & Gendreau, 2008). For example, the well-known and widely used organized/disorganized typology of serial murder has not been empirically supported (Canter, Alison, Alison, & Wentink, 2004). One of the core problems with offender profiling may be that its basic assumptions are faulty. For example, Mokros and Alison (2002) found that rapists who have similar offense behavior (e.g., gaging the victim) were not more similar with respect to age and other demographics (known as the homology assumption). Also, serial homicide offenders do not show a highly consistent pattern of offending (known as the behavioral consistency assumption; Bateman & Salfati, 2007; Trojan & Salfati, 2011). Perhaps then, it should not be surprising that profilers often either do not outperform, or only slightly outperform, detectives or the general population when it comes to predicting offender characteristics (Pinzotto & Finkel, 1990; Snook, Eastwood, Gendreau, Goggin, & Cullen, 2007). This may be partly due to profilers relying on the same "commonsense" ideas as the general public, rather than relying on empirical evidence (Snook at al., 2007). If the case is later solved, they may falsely attribute the resolution of the case to that crime scene belief; an example of illusory correlation (Chapman & Chapman, 1975; Snook et al., 2008).

Some research has claimed to support offender profiling. For example, Kocsis and colleagues have found that profilers can sometimes out predict non-profilers (see Kocsis,

2003a; 2003b; Kocsis, Hayes, & Irwin, 2002). However, this research does suffer from methodological issues (see Bennell, Jones, Taylor, & Snook, 2006). Nonetheless, if at least some specific beliefs or claims regarding the prediction of victim-perpetrator information are accurate, they might aid an investigation. For example, although Bateman and Salfati (2007) found no general consistency in behavior of serial homicide offenders, they did find that the behavior "oral sex by victim" was infrequent enough and consistent enough across an individuals' crimes to be potentially useful in a case. Here, we examine several potentially useful beliefs including overkill, location of trauma, cause of death, covering the body, and body position.

***Overkill***

Overkill is trauma inflicted on the victim beyond that which is necessary to cause death. For example, if a victim was shot 25 times in the head, a homicide investigator is likely to conclude that there was overkill. The belief is that the more evidence there is of overkill, the greater the likelihood that the victim knew the perpetrator (Douglas et al., 2013). This belief may be common among investigators. For instance, retired homicide investigator Richard A. Pickett stated that the presence of overkill suggests a crime of passion and that in 99% of overkill cases, the perpetrator knows the victim (Dowling, Martin, & Sherry, 2010). If true, this association would be useful in an investigation.

***Location of Trauma***

Location of trauma refers to where on the body the trauma has been inflicted. Trauma may be isolated to one area (e.g., shot in the head) or include multiple major traumas (e.g., a victim may be shot in the chest, neck, and head). One of the beliefs concerning location of trauma is that damage to the face/head is evidence of a personal assault or some closer relationship to the victim. For example, the *Crime Classification Manual* states that facial battery is common to spontaneous domestic homicides (Douglas et al., 2013).

***Cause of Death***

Although cause of death in a homicide includes a number of categories such as asphyxiation, gunshot trauma, sharp force trauma, blunt force trauma, poisoning, neglect, explosives and multiple means, some of the most common causes are gunshot trauma, sharp force trauma, asphyxiation, and blunt force trauma (Otzen, Sanhueza, Manterola, Hetz, & Melnik, 2015). Investigators may believe that certain types of trauma are indicative of the type of murder that has occurred. For example, blunt force trauma or strangulation is argued to be indicative of a domestic homicide, whereas a drug-related homicide would more typically involve a firearm or knife (Douglas et al., 2013). Additionally, poisoning may suggest a female perpetrator.

***Covering of Body***

Covering the body involves placing material over the dead body. For example, placing a shirt over the victim's face or a blanket over the entire body. Covering the body is not the same as containing the body. For example, if the body was found in a suitcase, the body was not simply covered. It is argued that finding the body in a container is evidence of transporting the victim or concealment in general, whereas covering the body indicates that

the perpetrator is remorseful (Douglas et al., 2013). Covering the body does not necessarily indicate that the perpetrator had a close relationship with the victim (e.g., certain sexual homicides), but it is generally believed to be an indicator of the perpetrator having some prior relationship with the victim.

***Body Position***

Body position is the orientation of the deceased victim. Although there are many positions that the body can be in, typically they are either face-up, face-down, or occasionally on their side. Some investigators have commented that, like the body being covered, finding the victim face-down can be a sign of the perpetrator's shame, and thus it is more likely that the perpetrator knew the victim. Body position also relates to the potential staging of the crime. According to the *Crime Classification Manual,* certain types of homicides, such as disorganized sexual homicides, may involve staging, or the intentional positioning of the body in an unusual way (Douglas et al., 2013). Douglas and colleagues (2013) argue that sexual homicide offenders frequently put the body in a degrading position.

## CURRENT RESEARCH

There are at least several crime scene beliefs that are explicitly taught through the *Crime Classification Manual* or are used in homicide investigations (Wright, 2013). Arguably, the greatest hurdle in testing these beliefs is collecting the relevant homicide data. To investigate the behavioral consistency assumption, Bateman and Salfati (2007) used data from the Homicide Investigation and Tracking System (HITS) in Seattle, Washington. However, databases such as HITS often lack the information needed to test investigator beliefs. For example, the number of traumatic impact wounds and orientation of the body are often not recorded. Thus, many existing databases are inadequate.

A source of homicide cases that can be used to investigate crime scene beliefs must have certain qualities. First, the homicide cases must include the specific crime scene details for which we are interested in, such as the position of the body. Second, homicide cases should include a variety of perpetrators and contexts of homicide, such as single episode homicide, serial murder, intimate partner homicide, etc. Additionally, homicide cases should be from around the country, allowing greater ability to generalize the findings. Third, the homicides should be solved cases. Fourth, the coding of each homicide case should not take so long as to severely limit the total number of cases that can reasonably be sampled. A novel solution for these challenges and the method used for the current research is gathering data from the crime documentary show, *Forensic Files* (Dowling, 2010).

In the last decade there has been an explosion of television documentary shows about homicide. One of the original and longest running of these (over 400 episodes) is *Forensic Files*. *Forensic Files* (which has also been televised under several other names) is a 30-minute program that presents a variety of cases demonstrating how different types of forensic evidence were used to solve violent crimes, mysterious accidents, and outbreaks of illness. Each episode also includes interviews with key people involved in the case, such as the prosecutor and forensic scientists. *Forensic Files* is particularly

useful when investigating how beliefs about the crime scene might relate to victim perpetrator relationships as the show commonly presents actual autopsy records, which aids in coding cause of death and presence of overkill. In fact, in creating each episode, *Forensic Files* will talk with the prosecutor in the case and they may attain case materials that have only been used at trial (P. Dowling, personal communication, November, 2016). Thus, not only are there the necessary details, but the show is very precise in terms of the facts of each case.

Researchers in other fields have used reality shows and game shows as a novel data source to test various hypotheses. For example, Levitt (2004) tested theories of discrimination using the television show *Weakest Link*. Ahmed (2013) tested co-ethnic preferences in Sweden using the reality cooking show *Come Dine with Me*. Kelley and Lemke (2015) investigated sex differences in risky decisions using the show *Cash Cab. Forensic Files* does differ in some ways, as it is a documentary show with a focus on education, rather than a reality show with a focus on entertainment. However, given the paucity of quality detailed homicide data, a show like *Forensic Files* may be a useful resource.

Based on the investigator beliefs we reviewed, we conducted exploratory analyses examining overkill, location of trauma, cause of death, covering the body, and body position as predictors, with the dependent variables being relationship with victim (closeness, i.e., stranger, acquaintance, or close relationship), familial relationship with victim (i.e., stranger, family with no blood relation, or genetic relative), if the crime was premeditated, and the perpetrator's sex.

## METHOD

### *Coding*

We created a coding file in a spreadsheet as well as a detailed spreadsheet describing every category and code. Due to the number of episodes (406), six coders were used, including all of the authors. We drew *Forensic Files* episodes from what was available on Amazon Prime and YouTube. Each coder was assigned a varying number of episodes. Episodes that did not include at least an involuntary manslaughter case or more serious type of homicide, for example a medical mystery, were not coded. Each line in the coding file was for a homicide victim. If there were multiple victims from the same perpetrator, but some victims were not discussed in detail, then those lacking detail were not coded. Cases in which the crime was unsolved were not coded. Coders were encouraged to be as descriptive as possible, but if a category could not be confidently coded, it was given a special code (99).

Coders went through training sessions with and without other coders to determine agreement and possible revision of categories. Next, all coders independently completed an initial set of the same nine episodes, which included a total of 14 homicide victims. These results were analyzed to determine agreement. Results indicated that in most cases there was 100% agreement (e.g., victim sex and multiple victims) or majority agreement (e.g., body covered, body position, and overkill). Coders subsequently met and discussed

the collectively coded 14 homicide cases until there was agreement on all categories. All disagreements were discussed, and when appropriate, the coding scheme was revised.

Over a six-month period, coders then completed their assigned episodes. After all episodes had been coded, data were compiled, and categories were reassessed. Some categories were recoded; for example, we recoded the category pertaining to location where the body was found. As there were far too many possibilities in this category, we created a category pertaining to if the location where the body was found was connected to the victim (e.g., the victim's house or car) or not connected to the victim (e.g., open field, hospital, etc.).

The major categories coded for analyses included: if more than one person was killed by the perpetrator, if the murder was premeditated, if the murder was committed with another crime, if the body was found, if the body was covered, if the body was transported, if the body was put in a container/wrapped, and overkill (0 = no, 1 = yes); victim sex and perpetrator sex (0 = female, 1 = male); cause of death (1 = shot, 2 = sharp force trauma, 3 = blunt force trauma, 4 = asphyxiation, 5 = poison, 6 = explosion/bombing, burned, vehicle use, or other, 7 = multiple major means), location of major trauma (0 = not localized/ diffuse, 1 = head, 2 = neck, 3 = body, 4 = multiple major traumas, 5 = none), number of major impact wounds, victim's connection with body location (0 = personal connection [e.g., victim's home or car], 1 = no personal connection [e.g., hospital]); if the body was naked (0 = no, 1= yes, 2 = partially nude), body position (0 = face down, 1 = face up, 2 = on side, 3 = other), victim's relationship to the perpetrator in terms of closeness (0 = stranger, 1 = acquaintance, 2 = close relationship, 3 = multiple perpetrators), and victims familial relationship with perpetrator (0 = non-family and non-genetic, 1 = family non-genetic, 2 = genetic, 3 = multiple perpetrators). Additional categories included the victim's name, the perpetrators name, season number, episode number, episode title, air date, and criminal charge for reference purposes. We also included several qualitative categories such as motive, notes about the body condition, and trauma notes, however we do not analyze those data here.

## RESULTS

There was a total of 411 homicide victims in the sample. As expected, there was no missing data from some categories, such as perpetrators sex, but in other cases there were significant instances of a coder being unable to complete it. For example, in the body position category, 197 victims could not be coded. Although significant portions of certain categories could not be coded, every category had at least 214 data points and most major categories had sufficient representation for each code. However, within specific comparisons and across categories some cells were underrepresented and, as discussed below, they do not represent sufficient tests.

These data were generally representative of typical homicides. For example, perpetrators were more likely to be male and the most common weapon used was a gun. These proportions are consistent with homicide statistics from the Uniform Crime Report

and others (United States Federal Bureau of Investigation, 2015b, 2015c, Otzen et al., 2015). However, there were also some notable differences. For example, data suggests that males are more than twice as likely as females to be victims of homicide (United States Federal Bureau of Investigation, 2015a). However, in our data, females (67.9%) were more likely to be the victims than males (32.1%). Similarly, the presence of rape or sexual assault (or attempted) was likely overrepresented in these data (22.4%). We discuss the implications for this representativeness in the discussion section. Below we detail the results for each of the homicide beliefs discussed, using multinomial logistic regression when the dependent variable was multichotomies, and binary logistic regression when the dependent variable was dichotomous. For cases in which there was not a single significant or marginal effect, we do not present a table of the results.

***Overkill***

Table 1 presents the frequency of relationship (closeness and familial), premeditation, and perpetrator sex by overkill.

Table 1: *Frequency of Relationship (closeness and familial), Premeditation, and Perpetrator Sex by Overkill*

| | No overkill | Overkill |
|---|---|---|
| Relationship (closeness) | | |
| Stranger | 96 (35.9%) | 28 (28.9%) |
| Acquaintance | 58 (21.5%) | 26 (26.8%) |
| Close relationship | 106 (39.3%) | 32 (33%) |
| Multiple perps | 10 (3.7%) | 11 (11.3%) |
| Relationship (familial) | | |
| Non-family, non-genetic | 181 (67.0%) | 67 (69.1%) |
| Family | 68 (25.2%) | 17 (17.5%) |
| Genetic relative | 12 (4.4%) | 3 (3.1%) |
| Multiple perps | 9 (3.3%) | 10 (10.3%) |
| Premeditation | | |
| Not premeditated | 93 (34.6%) | 36 (37.5%) |
| Premeditated | 176 (65.4%) | 60 (62.5%) |
| Perpetrator Sex | | |
| Males | 216 (80.0%) | 75 (77.3%) |
| Females | 33 (12.2%) | 7 (7.2%) |
| Multiple perps | 21 (7.8%) | 15 (15.5%) |

**Relationship (closeness)**.

*Acquaintance compared to stranger*. The coefficient for overkill was not statistically different from zero ($B$ = 0.430, $p$ = .178, $SE$ = 0.319, $OR$ = 1.537). That is, those who overkilled relative to those who did not overkill were not significantly more likely to be an acquaintance compared to a stranger.

*Close relationship compared to stranger*. The coefficient for overkill was not statistically different from zero ($B$ = 0.034, $p$ = .907, $SE$ = 0.295, $OR$ = 1.035). Those who overkilled relative to those who did not overkill were not significantly more likely to have a close relationship with the victim compared to being a stranger.

*Multiple perpetrators compared to stranger*. The logit for those who overkilled relative to those who did not overkill was 1.327 units higher for multiple perpetrators relative to strangers ($SE$ = 0.487, $p$ = .006). Thus, those who overkilled were 3.771 times more likely than those who did not overkill to be multiple perpetrators with varying relationships to the victim than a single stranger (95% CI [1.452, 9.793]). This effect was also tested by recoding all single perpetrators as 0 and multiple perpetrators as 1. The effect continued to be significant ($p < .05$), suggesting it was not something specific about the comparison of multiple perpetrators to single stranger offenders.

**Relationship (familial)**.

*Family compared to non-family, non-genetic, stranger*. The coefficient for overkill was not statistically different from zero ($B$ = -0.392, $p$ = .200, $SE$ = 0.307, $OR$ = 0.675). That is, those who overkilled relative to those who did not overkill were not significantly more likely to be a family member compared to a non-family, non-genetic, stranger.

*Genetic relative compared to non-family, non-genetic, stranger*. The coefficient for overkill was not statistically different from zero ($B$ = -0.392, $p$ = .553, $SE$ = 0.661, $OR$ = 0.675). Those who overkilled relative to those who did not overkill were not significantly more likely to be a genetic relative compared to being a non-family, non-genetic, stranger.

*Multiple perpetrators compared to non-family, non-genetic, stranger*. The logit for those who overkilled relative to those who did not overkill was 1.099 units higher for multiple perpetrators relative to non-family, non-genetic, strangers ($SE$ = 0.481, $p$ = .022). Thus, those who overkilled were 3.002 times more likely than those who do not overkill to be multiple perpetrators with varying familial/genetic relationships to the victim than a single non-family, non-genetic, stranger (95% CI [1.169, 7.708].

**Premeditated**. Overkill was not a significant predictor of whether the homicide was rated as premediated or not ($B$ = -0.127, $p$ = .607, $SE$ = 0.247, $OR$ = 1.892).

**Perpetrator's sex**.

*Female compared to male*. The regression coefficient for overkill was not statistically different from zero ($B$ = -0.493, $p$ = .260, $SE$ = 0.437, $OR$ = 0.611). That is, those who committed overkill relative to those who did not commit overkill were not significantly more or less likely to be female compared to male.

*Multiple perpetrators compared to males*. The logit for those who committed overkill relative to those who did not commit overkill was 0.721 units higher for multiple perpetrators relative to males ($p$ = .047). Thus, those who committed overkill were 2.057 times more likely than those who did not commit overkill to be multiple perpetrators than males (95% CI [1.009, 4.196]).

***Location of Trauma***

Table 2 presents the frequency of relationship (closeness and familial) and perpetrator sex by location of trauma.

Table 2: *Frequency of Relationship (closeness and familial) and Perpetrator Sex by Location of Trauma*

| | Not localized | None | Head | Neck | Body | Multiple major traumas |
|---|---|---|---|---|---|---|
| Relationship (closeness) | | | | | | |
| Stranger | 11(32.4%) | 14 (29.2%) | 20 (19.0%) | 24 (55.8%) | 18 (45.0%) | 26 (38.8%) |
| Acquaintance | 7 (20.6%) | 7 (14.6%) | 27 (25.7%) | 5 (11.6%) | 10 (25.0%) | 18 (26.9%) |
| Close relationship | 14 (41.2%) | 26 (54.2%) | 55 (52.4%) | 12 (27.9%) | 10 (25.0%) | 16 (23.9%) |
| Multiple perps | 2 (5.9%) | 1 (2.1%) | 3 (2.9%) | 2 (4.7%) | 2 (5.0%) | 7 (10.4%) |
| Relationship (familial) | | | | | | |
| Non-family, non-genetic | 23 (67.6%) | 26 (54.2%) | 63 (60%) | 31 (72.1%) | 32 (80.0%) | 49 (73.1%) |
| Family | 6 (17.6%) | 19 (39.6%) | 34 (32.4%) | 9 (20.9%) | 5 (12.5%) | 11 (16.4%) |
| Genetic relative | 3 (8.8%) | 2 (4.2%) | 6 (5.7%) | 1 (2.3%) | 1 (2.5%) | 1 (1.5%) |
| Multiple perps | 2 (5.9%) | 1 (2.1%) | 2 (1.9%) | 2 (4.7%) | 2 (5.0%) | 6 (9.0%) |
| Perpetrator Sex | | | | | | |
| Males | 28 (82.4%) | 32 (66.7%) | 83 (79.0%) | 40 (93.0%) | 33 (82.5%) | 54 (80.6%) |
| Females | 3 (8.8%) | 15 (31.3%) | 12 (11.4%) | 0 (0.0%) | 4 (10.0%) | 3 (4.5%) |
| Multiple perps | 3 (8.8%) | 1 (2.1%) | 10 (9.5%) | 3 (7.0%) | 3 (7.5%) | 10 (14.9%) |

**Relationship (closeness)**.

*Acquaintance compared to stranger*. The regression coefficients for no trauma (i.e., none; $B$ = -0.241, SE = .669, $OR$ = 0.786), head trauma ($B$ = 0.752, $SE$ = 0.566, $OR$ = 2.121), neck trauma ($B$ = -1.117, $SE$ = 0.690, $OR$ = 0.327), body trauma ($B$ = -0.136, $SE$ = 0.624, $OR$ = 0.873), and multiple major traumas ($B$ = 0.084, $SE$ = 0.573, $OR$ = 1.088) were not statistically different from zero ($p$s > .105). In other words, location of trauma did not predict whether the perpetrator was an acquaintance to the victim versus a stranger.

*Close relationship compared to stranger*. The regression coefficients for no trauma (*B* = 0.378, *SE* = 0.522, *OR* = 1.459), head trauma (*B* = 0.770, *SE* = 0.480, *OR* = 2.161), neck trauma (*B* = -0.934, *SE* = 0.536, *OR* = 0.393), and multiple major traumas (*B* = -0.727, *SE* = 0.513, *OR* = 1.481), were not statistically different from zero (*p*s > .081). In other words, location of trauma did not predict whether the perpetrator had a close relationship to the victim versus a stranger.

*Multiple perpetrators compared to stranger*. The regression coefficients for no trauma (*B* = -0.934, *SE* = 1.289, *OR* = 0.393), head trauma (*B* = -0.192, *SE* = 0.987, *OR* = 0.825), neck trauma (*B* = -0.780, *SE* = 1.064, *OR* = 0.458), body trauma (*B* = -0.492, *SE* =1.071, *OR* = 0.611), and multiple major traumas (*B* = 0.393, *SE* = 0.897, *OR* = 1.481) were not statistically different from zero (*p*s > .464). In other words, location of trauma did not predict whether there were multiple perpetrators versus a stranger.

**Relationship (familial)**.

*Family compared to non-family, non-genetic, stranger*. The logit for when there was no trauma relative to when the trauma was not localized was 1.030 units higher when the perpetrator was a family member compared to being a non-family, non-genetic, stranger. However, this effect was only marginal (*p* =.061, *SE* = 0.549, *OR* = 2.801, 95% CI [0.955, 8.214]). The regression coefficients for head trauma (*B* = 0.727, *SE* = 0.505, *OR* = 2.069), neck trauma (*B* = 0.107, *SE* = 0.595, *OR* = 1.113), body trauma (*B* = -0.513, *SE* = 0.664, *OR* = 0.599), and multiple major traumas (*B* = -0.150, *SE* = 0.567, *OR* = 0.861) were not statistically different from zero (*p*s > .150). That is, when the location of the major trauma(s) was localized primarily to the head, or neck, or body, or when there were multiple major traumas relative to the trauma not being localized, the perpetrator was not significantly more or less likely to be a family member compared to being a non-family, non-genetic, stranger.

*Genetic relative compared to non-family, non-genetic, stranger*. The regression coefficients for no trauma (*B* = -0.528, *SE* = 0.957, *OR* = 0.590), head trauma (*B* = -0.314, *SE* = 0.748, *OR* = 0.730), neck trauma (*B* = -1.397, *SE* = 1.187, *OR* = 0.247), body trauma (*B* = -1.429, *SE* = 1.187, *OR* = 0.240), and multiple major traumas (*B* = -1.855, *SE* = 1.182, *OR* = 0.156) were not statistically different from zero (*p*s > .117). That is, when the location of the major trauma(s) was localized primarily to the head, or neck, or body, or there was no major trauma, or when there were multiple major traumas relative to the trauma not being localized the perpetrator was not significantly more or less likely to be a genetic relative compared to a being a non-family, non-genetic, stranger.

*Multiple perpetrators compared to non-family, non-genetic, stranger*. The regression coefficients for no trauma (*B* = -0.816, *SE* = 1.258, *OR* = 0.442), head trauma (*B* = -1.008, *SE* = 1.029, *OR* = 0.365), neck trauma (*B* = -0.298, *SE* = 1.037, *OR* = 0.742), body trauma (*B* = -0.330, *SE* = 1.037, *OR* = 0.719), and multiple major traumas (*B* = 0.342, *SE* = 0.855, *OR* = 1.408) were not statistically different from zero (*p*s > .328). That is, when the location of the major trauma(s) was localized primarily to the head, or neck, or body, or there was no major trauma, or when there were multiple major traumas relative

to the trauma not being localized, the crime was not significantly more or less likely to be committed by multiple perpetrators with varying relationships to the victim compared to a single non-family, non-genetic, stranger.

**Perpetrator's sex**.

*Female compared to male*. The logit for when there was no major trauma was 1.476 units higher when the perpetrator was female compared to male ($p$ = .031, $SE$ = 0.683). Thus, when there was no major trauma compared to the trauma not being localized, the perpetrator was more likely to be female versus male. For instances where there was no major trauma compared to trauma not being localized, the odds of being a female compared to a male perpetrator were 4.375 times greater (95% CI [1.146, 16.697]). The regression coefficients for head trauma ($B$ = 0.300, $SE$ = 0.681, $OR$ = 1.349), body trauma ($B$ = 0.123, $SE$ = 0.806, $OR$ = 1.131), and multiple major traumas ($B$ = -0.657, $SE$ = 0.849, $OR$ = 0.519) were not statistically different from zero ($p$s > .439). That is, when the location of the major trauma(s) was localized primarily to the head, or body, or when there were multiple major traumas relative to the trauma not being localized the perpetrator was not significantly more or less likely to be a female compared to a being a male. The effect of localized trauma at the neck is not meaningfully interpreted, as there was not a single case of neck trauma with a female perpetrator.

*Multiple perpetrators compared to males*. The regression coefficients for no trauma ($B$ = -1.232, $SE$ = 1.183, $OR$ = 0.292), head trauma ($B$ = 0.117, $SE$ = 0.694, $OR$ = 1.124), neck trauma ($B$ = -0.357, $SE$ = 0.853, $OR$ = 0.700), body trauma ($B$ = -0.164, $SE$ = 0.856, $OR$ = 0.848), and multiple major traumas ($B$ = 0.547, $SE$ = 0.698, $OR$ = 1.728) were not statistically different from zero ($p$s > .298). That is, when the location of the major trauma(s) was localized primarily to the head, or neck, or body, or there was no major trauma, or when there were multiple major traumas relative to the trauma not being localized, the crime was not significantly more or less likely to have been committed by multiple perpetrators of varying combinations of sex compared to a being a male perpetrator. However, multiple perpetrators were relatively rare.

***Cause of Death***

Table 3 presents the frequency of relationship (closeness and familial), premeditation, and perpetrator sex by cause of death.

Table 3: *Frequency of Relationship (closeness and familial), Premeditation, and Perpetrator Sex by Cause of Death*

| | Shot | Multiple means | Sharp force | Blunt force | Asphyxiation | Poison | Explosion, burn, vehicle, other means |
|---|---|---|---|---|---|---|---|
| Relationship (closeness) | | | | | | | |
| Stranger | 25 (20.7%) | 9 (40.9%) | 29 (43.9%) | 15 (32.6%) | 46 (47.9%) | 4 (14.3%) | 5 (41.7%) |
| Acquaintance | 39 (32.2%) | 8 (36.4%) | 17 (25.8%) | 5 (10.9%) | 14 (14.6%) | 6 (21.4%) | 3 (25.0%) |
| Close relationship | 47 (38.8%) | 4 (18.2%) | 16 (24.2%) | 24 (52.2%) | 33 (34.4%) | 16 (57.1%) | 4 (33.3%) |
| Multiple perps | 10 (8.3%) | 1 (4.5%) | 4 (6.1%) | 2 (4.3%) | 3 (3.1%) | 2 (7.1%) | 0 (0.0%) |
| Relationship (familial) | | | | | | | |
| Non-family, non- genetic | 78 (64.5%) | 20 (90.9%) | 53 (80.3%) | 30 (65.2%) | 63 (65.6%) | 14 (50.0%) | 8 (66.7%) |
| Family | 28 (23.1%) | 1 (4.5%) | 8 (12.1%) | 14 (30.4%) | 27 (28.1%) | 11 (39.3%) | 1 (8.3%) |
| Genetic relative | 6 (5.0%) | 0 (0.0%) | 1 (1.5%) | 1 (2.2%) | 3 (3.1%) | 1 (3.6%) | 3 (25.0%) |
| Multiple perps | 9 (7.4%) | 1 (4.5%) | 4 (6.1%) | 1 (2.2%) | 3 (3.1%) | 2 (7.1%) | 0 (0.0%) |
| Premeditation | | | | | | | |
| Not premeditated | 25 (20.7%) | 10 (52.6%) | 25 (38.5%) | 24 (52.2%) | 46 (48.4%) | 2 (7.1%) | 3 (25.0%) |
| Premeditated | 96 (79.3%) | 9 (47.4%) | 40 (61.5%) | 22 (47.8%) | 49 (51.6%) | 26 (92.9%) | 9 (75.0%) |
| Perpetrator Sex | | | | | | | |
| Males | 84 (69.4%) | 15 (68.2%) | 56 (84.8%) | 43 (93.5%) | 88 (91.7%) | 16 (57.1%) | 10 (83.3%) |
| Females | 15 (12.4%) | 3 (13.6%) | 5 (7.6%) | 1 (2.2%) | 3 (3.1%) | 10 (35.7%) | 2 (16.7%) |
| Multiple perps | 22 (18.2%) | 4 (18.2%) | 4 (7.6%) | 2 (4.3%) | 5 (5.2%) | 2 (7.1%) | 0 (0.0%) |

**Relationship (closeness)**.

*Acquaintance compared to stranger*. The regression coefficients for multiple means ($B$ = -0.562, $SE$ = 0.549, $OR$ = 0.570), poison ($B$ = -0.039, $SE$ = 0.694, $OR$ = 0.962), and other means ($B$ = -0.956, $SE$ = 0.774, $OR$ = 0.385) were not statistically different from zero ($p$s > .217). That is, when the cause of death was due to multiple means (e.g., shot and stabbed), poison, or other means (i.e., explosion, burning, vehicle, and other), relative to the cause of death being shot, the perpetrator was not significantly more or less likely to be an acquaintance compared to a stranger. However, we note that the frequencies for each of these cause of death categories was relatively low. The logits for the cause of death being related to sharp force trauma, blunt force trauma, and asphyxiation, were -0.979 units ($p$ = .014, $SE$ = 0.399, $OR$ = 0.396, 95% CI [0.172, 0.821]), -0.1543 units ($p$ = .007, $SE$ = 0.576, $OR$ = 0.214, 95% CI [0.069, 0.661]), and -1.634 units ($p$ < .001, $SE$ = 0.399, $OR$ = 0.195, 95% CI [0.089, 0.426]), respectively, lower for acquaintances relative to strangers. Thus, when the cause of death was related to sharp force trauma, blunt force trauma, or

asphyxiation, relative to shooting, it was more likely that the perpetrator was a stranger compared to an acquaintance.

*Close relationship compared to stranger*. The regression coefficients for blunt force trauma (*B* = -0.161, *SE* = 0.412, *OR* = 0.851), poison (*B* = 0.755, *SE* = 0.611, *OR* = 2.128), and other means (*B* = -0.854, *SE* = 0.715, *OR* = 0.426) were not statistically different from zero (*p*s > .217). That is, when the cause of death was due to blunt force trauma, poison, or other means, relative to the cause of death being shot, the perpetrator was not significantly more or less likely to have a close relationship with the victim compared to being a stranger. The logits for the cause of death being related to multiple means, sharp force trauma, and asphyxiation, were -1.442 units (*p* = .026, *SE* = 0.650, *OR* = 0.236, 95% CI [0.066, 0.845]), -1.226 units (*p* = .002, *SE* = 0.398, *OR* = 0.293, 95% CI [0.135, 0.640]), and -0.963 units (*p* = .004, *SE* = 0.337, *OR* = 0.382, 95% CI [0.197, 0.738]), respectively, lower for acquaintances relative to strangers. Thus, when the cause of death was related to multiple means, sharp force trauma, or asphyxiation, relative to shooting, it was more likely that the perpetrator was a stranger to the victim compared to having a close relationship.

*Multiple perpetrators compared to stranger*. While the reference category for cause of death, shot, is well represented, all other categories in cause of death were not sufficiently represented and thus do not provide adequate tests for this category.

**Relationship (familial)**.

*Family compared to non-family, non-genetic, stranger*. The regression coefficients for blunt force (*B* = 0.262, *SE* = 0.392, *OR* = 1.300]), asphyxiation (*B* = 0.177, *SE* = 0.319, *OR* = 1.194), poison (*B* = 0.783, *SE* = 0.459, *OR* = 2.189), and other means (*B* = -1.055, *SE* = 1.083, *OR* = 0.348) were not statistically different from zero (*p*s > .088). When the cause of death was due to blunt force trauma, asphyxiation, poison, or other means, relative to the cause of death being shot, the perpetrator was not significantly more or less likely to be a family member compared to a non-family, non-genetic, stranger. Multiple means and sharp force trauma were marginally significant, with the coefficients being -1.971 units (*p* = .060, *SE* = 1.048, *OR* = 0.139, 95% CI [0.018, 1.087]) and -.866 units (*p* = .048, *SE* = 0.439, *OR* = 0.420, 95% CI [0.178, 0.993]) respectively, lower for family members relative to strangers. Thus, when the cause of death was related to multiple means or sharp force trauma, relative to shooting, it was more likely that the perpetrator was a non-family, non-genetic, stranger compared to family member.

*Genetic relative compared to non-family, non-genetic, stranger*. Most categories in cause of death that were caused by genetic relatives were not sufficiently represented and thus do not provide adequate tests for this category.

*Multiple perpetrators compared to non-family, non-genetic, stranger*. Most categories in cause of death for that were caused by multiple perpetrators were not sufficiently represented and thus do not provide adequate tests for this category.

**Premeditated**. As can be seen in Table 4, relative to the cause of death being shot, multiple means, sharp force trauma, blunt force trauma, and asphyxiation were significant

predictors of premeditation (*p*s ≤ .01). The odds of the homicide being premeditated decreased by 76.6%, 58.3%, 76.1% and 72.3% when the cause of death was due to multiple means, sharp force trauma, blunt force trauma, and asphyxiation (respectively) compared to a shooting death. Alternatively, if the cause of death was due to being shot, the odds that the homicide was premediated increased. The effects of poison and explosion were not significant (*p*s > .112).

Table 4: *Results for the Logistic Regression of Cause of Death Predicting Premeditation*

| | *B* | *S.E.* | Wald | *p* | Exp(*B*) (CI 95%) |
|---|---|---|---|---|---|
| Intercept | 1.345 | .225 | 35.907 | <.000 | 3.840 |
| Multiple means | -1.451 | .511 | 8.049 | .005 | 0.234 (0.086, 0.636) |
| Sharp force | -.875 | .340 | 6.641 | .010 | 0.417 (0.214, 0.811) |
| Blunt force | -1.432 | .371 | 14.920 | <.001 | 0.239 (0.115, 0.494) |
| Asphyxiation | -1.282 | .304 | 17.764 | <.001 | 0.277 (0.153, 0.504) |
| Poison | 1.219 | .767 | 2.525 | .112 | 3.385 (0.752, 15.234) |
| Explosion, burn, vehicle, other means | -.247 | .703 | .123 | .726 | 0.781 (0.197, 3.102) |

**Perpetrator's sex**.

*Female compared to male*. The regression coefficients for multiple means, sharp force, and other means, were not statistically different from zero (see Table 5). That is, when the cause of death was due to multiple means, sharp force trauma, or other means, relative to being shot, it was not significantly more or less likely to be a female perpetrator compared to a male perpetrator. The effect of blunt force trauma, relative to shooting, was marginally significant ($p = .052$). When the cause of death was blunt force trauma, relative to being shot, the odds that the perpetrator was a female compared to male decreased 87%. The logit for asphyxiation was significant and -1.656 units lower for females relative to males ($p = .011$). When the cause of death was asphyxiation, relative to shooting, the odds that the perpetrator was a female, compared to male, decreased by 80.9%. The logit for poison was significant and 1.253 units greater for females relative to males ($p = .011$). When the cause of death was poison, relative to shooting, the odds that the perpetrator was a female, compared to male, increased by 350%. However, also note that for those homicides in which the cause of death was due to poison, the majority of perpetrators were still male (57.1%).

*Multiple perpetrators compared to males*. Most categories in cause of death that were caused by multiple perpetrators were not sufficiently represented and thus do not provide adequate tests for this category.

Table 5: *Results for the Multinomial Logistic Regression of Cause of Death Predicting Sex*

| | Female | | | | Multiple perps | | | |
|---|---|---|---|---|---|---|---|---|
| | *B* | *S.E.* | *p* | Exp(*B*) (CI 95%) | *B* | *S.E.* | *p* | Exp(*B*) (CI 95%) |
| Intercept | -1.723 | .280 | <.000 | | -1.340 | .239 | <.000 | |
| Multiple means | .113 | .692 | .870 | 1.120 (.289, 4.346) | .018 | .612 | .976 | 1.018 (.307, 3.376) |
| Sharp force | -.693 | .544 | .203 | .500 (.172, 1.453) | -1.076 | .525 | .040 | .341 (.122, .953) |
| Blunt force | -2.038 | 1.050 | .052 | .130 (.017, 1.019) | -1.728 | .762 | .023 | .178 (.040, .791) |
| Asphyxiation | -1.656 | .651 | .011 | .191 (.053, .683) | -1.528 | .518 | .003 | .217 (.079, .599) |
| Poison | 1.253 | .491 | .011 | 3.500 (1.337, 9.162) | -.740 | .787 | .347 | .477 (.102, 2.233) |
| Explosion, burn, vehicle, other means | .113 | .824 | .891 | 1.120 (.223, 5.629) | -19.845 | .000 | -- | -- |

***Covering the Body***

Table 6 presents the frequency of relationship (closeness and familial), premeditation, and perpetrator sex by covering the body.

Table 6: *Frequency of Relationship (closeness and familial), Premeditation, and Sex by Covering the Body*

| | | Not covered | Covered |
|---|---|---|---|
| Relationship (closeness) | Stranger | 101 (35.2%) | 11 (28.9%) |
| | Acquaintance | 68 (23.7%) | 10 (26.3%) |
| | Close relationship | 101 (35.2%) | 15 (39.5%) |
| | Multiple perps | 17 (5.9%) | 2 (5.3%) |
| Relationship (familial) | Non-family, non-genetic | 195 (67.9%) | 25 (65.8%) |
| | Family | 65 (22.6%) | 11 (28.9%) |
| | Genetic relative | 12 (4.2%) | 0 (0.0%) |
| | Multiple perps | 15 (5.2%) | 2 (5.3%) |
| Premeditation | Not premeditated | 102 (35.9%) | 11 (28.9%) |
| | Premeditated | 182 (64.1%) | 27 (71.1%) |
| Sex | Males | 232 (80.8%) | 31 (81.6%) |
| | Females | 23 (8.0%) | 5 (13.2%) |
| | Multiple perps | 32 (11.1%) | 2 (5.3%) |

**Relationship (closeness)**.

*Acquaintance compared to stranger*. The effect of covering the body was not statistically different from zero ($p > .518$, $B = 0.300$, $SE = 0.464$, $OR = 1.350$). That is, when the body was covered, relative to uncovered, the perpetrator was not significantly more likely to be an acquaintance compared to a stranger.

*Close relationship compared to stranger*. The effect of covering the body was not statistically different from zero ($B = 0.310$, $p > .461$, $SE = 0.421$, $OR = 1.364$). When the body was covered, relative to uncovered, the perpetrator was not significantly more likely to have a close relationship with the victim compared to being a stranger.

*Multiple perpetrators compared to stranger*. The effect of covering the body was not statistically different from zero ($B = 0.077$, $p > .924$, $SE = 0.812$, $OR = 1.080$). When the body was covered, relative to uncovered, the crime was not significantly more likely to have been committed by multiple perpetrators compared to having been committed by a single stranger.

**Relationship (familial)**.

*Family compared to non-family, non-genetic, stranger*. The effect of covering the body was not statistically different from zero ($B = 0.278$, $p > .476$, $SE = 0.389$, $OR = 1.320$). That is, when the body was covered, relative to uncovered, the perpetrator was not significantly more likely to be a family member compared to a stranger.

*Genetic relative compared to non-family, non-genetic, stranger*. The effect of covering the body could not be tested, as there was not a single case of a genetic relative covering the body.

*Multiple perpetrators compared to non-family, non-genetic, stranger*. Although the frequency was low, the effect of covering the body was not statistically different from zero ($B = 0.039$, $p > .960$, $SE = 0.782$, $OR = 1.040$). When the body was covered, relative to uncovered, the crime was not significantly more likely to have been committed by multiple perpetrators compared to having been committed by a single non-family, non-genetic, stranger.

**Premeditated**. Covering the body was not a significant predictor of whether the homicide was rated as premediated or not ($p = .399$, $OR = 1.376$).

**Perpetrator's sex**.

*Female compared to male*. The regression coefficient for covering the body was not statistically different from zero ($B = 0.487$, $p > .358$, $SE = 0.529$, $OR = 1.627$). Thus, when the body was covered, relative to uncovered, it was not significantly more likely to be a female perpetrator compared to a male perpetrator.

*Multiple perpetrators compared to males*. The regression coefficient for covering the body ($B = -.760$), was not statistically different from zero ($B = -0.760$, $p > .313$, $SE = 0.754$, $OR = 0.468$). Thus, when the body was covered, relative to uncovered, the crime was

not significantly more likely to have been committed by multiple perpetrators compared to a single male perpetrator.

***Body Position***

Table 7 presents the frequency of relationship (closeness and familial), premeditation, and perpetrator sex by body position.

Table 7: *Frequency of Relationship (closeness and familial), Premeditation, and Sex by Body Position*

| | Face up | Other | Face down | On side |
|---|---|---|---|---|
| Relationship (closeness) | | | | |
| Stranger | 40 (37.0%) | 2 (28.6%) | 20 (29.4%) | 9 (29.0%) |
| Acquaintance | 22 (20.4%) | 3 (42.9%) | 18 (26.5%) | 7 (22.6%) |
| Close relationship | 38 (35.2%) | 2 (28.6%) | 27 (39.7%) | 14 (45.2%) |
| Multiple perps | 8 (7.4%) | 0 (0.0%) | 3 (4.4%) | 1 (3.2%) |
| Relationship (familial) | | | | |
| Non-family, non-genetic | 72 (66.7%) | 5 (71.4%) | 41 (60.3%) | 19 (61.3%) |
| Family | 28 (25.9%) | 2 (28.6%) | 20 (28.4%) | 9 (29.0%) |
| Genetic relative | 1 (.09%) | 0 (0.0%) | 4 (5.9%) | 2 (6.5%) |
| Multiple perps | 7 (6.5%) | 0 (0.0%) | 3 (4.4%) | 1 (3.2%) |
| Premeditation | | | | |
| Not premeditated | 38 (35.2%) | 3 (42.9%) | 28 (41.2%) | 10 (32.3%) |
| Premeditated | 70 (64.8%) | 4 (57.1%) | 40 (58.8%) | 21 (67.7%) |
| Perpetrator Sex | | | | |
| Males | 88 (81.5%) | 7 (100.0%) | 56 (82.4%) | 26 (83.9%) |
| Females | 9 (8.3%) | 0 (0.0%) | 8 (11.8%) | 3 (9.7%) |
| Multiple perps | 11 (10.2%) | 0 (0.0%) | 4 (5.9%) | 2 (6.5%) |

**Relationship (closeness)**.

*Acquaintance compared to stranger*. The regression coefficients for the body found face down ($B$ = 0.492, $SE$ = 0.420, $OR$ = 1.636) and on the side ($B$ = 0.347, $SE$ = 0.570, $OR$ = 1.414) were not statistically different from zero ($ps$ > .291). That is, when the body was found face down or on the side, relative to being found face up, the perpetrator was not significantly more likely to be an acquaintance compared to a stranger. The frequency for when the body was found in some other position was too low to provide an adequate test.

*Close relationship compared to stranger*. The regression coefficients for the body found face down ($B$ = 0.351, $SE$ = 0.372, $OR$ = 1.421) and on the side ($B$ = 0.493, $SE$ = 0.484, $OR$ = 1.637) were not statistically different from zero ($ps$ > .308). That is, when the body was found face down or on the side, relative to being found face up, the perpetrator

was not significantly more likely to have a close relationship with the victim compared to being a stranger. The frequency for when the body was found in some other position was too low to provide an adequate test.

*Multiple perpetrators compared to stranger*. The reference category for body position found face up is sufficiently represented, but all other categories were not sufficiently represented and thus do not provide adequate tests for multiple perpetrators.

**Relationship (familial)**.

*Family compared to non-family, non-genetic, stranger*. The regression coefficients for the body found face down ($B$ = 0.227, $SE$ = 0.352, $OR$ = 1.254) and on the side ($B$ = 0.197, $SE$ = 0.462, $OR$ = 1.218) were not statistically different from zero ($ps$ > .520). Thus, when the body was found face down or on the side, relative to being found face up, the perpetrator was not significantly more likely to be a member of the victim's family compared to being a stranger. The frequency for when the body was found in some other position was too low to provide an adequate test.

*Genetic relative compared to non-family, non-genetic, stranger*. The cell frequencies for genetic relatives as the perpetrator were not sufficiently represented and thus do not provide adequate tests.

*Multiple perpetrators compared to non-family, non-genetic, stranger*. The cell frequencies for multiple perpetrators were not sufficiently represented and thus do not provide adequate tests.

**Premeditated**. The body being found face down ($B$ = -0.254, $p$ = .424, $SE$ = 0.318, $OR$ = 0.776) or the body being found on their side ($B$ = 0.131, $p$ = .763, $SE$ = 0.434, $OR$ = 1.140), compared to being found face up, did not significantly predict whether the homicide was rated as premediated or not. The frequency for when the body was found in some other position was too low to provide an adequate test.

**Perpetrator's sex**.

*Female compared to male*. The regression coefficient for the body found face down was not statistically different from zero ($B$ = 0.334, $p$ = .516, $SE$ = 0.515, $OR$ = 1.397). Thus, when the body was found face down, relative to being found face up, the perpetrator was not significantly more likely to be a male compared to a female. The frequency for when the body was found in some other position or was on their side was too low to provide an adequate test.

*Multiple perpetrators compared to males*. The reference category for body position, found face up, is sufficiently represented, but all other categories were not sufficiently represented and thus do not provide adequate tests for multiple perpetrators.

***Additional Analyses***

In addition to the main set of beliefs we tested, three additional sets of analyses were conducted. First, we tested if finding the body wrapped up or in a container is predictive of transporting the victim. A chi-square test of independence was performed to examine the

relation between body wrapped/in a container and body transported. The relation between these variables was significant, $\chi^2$ (1, $N$ = 310) = 77.428, $p$ < .001, Cramer's $V$ = .481. Thus, finding the body wrapped or in a container was associated with the body having been transported and was a medium to large effect (Cohen, 1988). We also tested if this same effect would hold for finding the body covered. The relation between body being covered and body transported was significant, $\chi^2$ (1, $N$ = 310) = 7.405, $p$ = .007, Cramer's $V$ = .155. In other words, even covering the body was associated with transporting the victim, though the effect size was much smaller.

Next, we tested the relationship between the total number of traumatic wounds found on the body and the offender's relationship to the victim. Using multinomial logistic regression, there was a marginal effect ($p$ = .07) of acquaintance compared to stranger, whereby acquaintances were slightly more likely to inflict a greater number of wounds ($B$ = 0.036; 95% C.I. [0.997, 1.079]). The relationships between close relationship and multiple perpetrators, relative to strangers, were not significant ($p$ > .221).

Lastly, we tested the relationship between finding the body naked, partially naked, or not naked (clothed) with whether the victim had been raped (for example, based on DNA evidence), there was an attempted rape (for example, as revealed in a confession), or if the police highly suspected rape (for example, based on evidence at autopsy), hereafter referred to as raped. As can be seen in Table 8, relative to the body being found clothed, when the body was found partially nude or nude significantly predicted if the victim had been raped ($p$s < .001). The odds that the victim was raped increase by over 10 times if the victim was found partially nude and increase over 13 times if the victim was found fully nude.

Table 8: *Results for the Logistic Regression of Nudity of the Victim Predicting Rape*

| | *B* | *S.E.* | Wald | *p* | Exp(*B*) (CI 95%) |
|---|---|---|---|---|---|
| Intercept | -2.490 | .260 | 91.615 | <.001 | 0.083 |
| Partially nude | 2.385 | .416 | 32.828 | <.001 | 10.856 (4.802, 24.545) |
| Nude | 2.592 | .368 | 49.522 | <.001 | 13.355 (6.488, 27.488) |

In a final set of analyses, we performed several logistic regressions on a simplified coding of the relationship to the victim in terms of closeness. The closeness of the victim and perpetrator is perhaps the single most important variable studied here that might inform an investigation. We wished to explore the data further to see if effects changed with a simpler categorization scheme. To recode relationship-closeness, we removed multiple perpetrators as a category as they were relatively infrequent and contained a mix of relationship types. We then coded all acquaintances and close relationships as 1 (now referred to as some prior relationship), with strangers remaining 0. Next, we tested the relationship of overkill, cause of death, and covering the body, with relationship (stranger

vs. prior relationship). The effects were largely the same. For example, in the multinomial logistic regression, no significant effects were observed for covering the body on relationship (closeness) and in the simplified analyses the effect was $p = .424$. Similarly, in the multinomial logistic regression analyses for cause of death and relationship (closeness), we found significant effects for sharp force trauma and asphyxiation for both acquaintances and close relationships. Similarly, in the simplified analyses, we found that when the cause of death was sharp force trauma ($p = .001$), the perpetrator was more likely to be a stranger ($B = -1.106$; $OR = 0.331$) and when the cause of death was asphyxiation ($p < .001$), the perpetrator was more likely to be a stranger ($B = -1.214$; $OR = 0.297$). Thus, the results changed little with a more simplified coding scheme. Finally, we tested if rape predicted the simplified relationship (closeness) variable. The relationship was significant, $\chi^2$ (1, $N$ = 389) = 51.013, $p < .001$, Cramer's $V = .362$. In other words, if there was evidence that the homicide victim was raped, it was more likely that the perpetrator was a stranger, than an acquaintance or close relationship.

## DISCUSSION

Homicide investigators have a difficult job and must use every tool available to solve cases. They are likely to rely on their implicit and explicit beliefs regarding the crime scene to guide their theory of the case. If trust in these beliefs is misplaced, investigators may pursue false leads or miss important clues. This can result in a killer not being caught or an innocent person being arrested. Some beliefs about crime scene features and their relationship to the perpetrator are explicitly taught through books like the *Crime Classification Manual* with little or no empirical support cited (Douglas et al., 2013). Without access to quality homicide databases, it is difficult to test the veracity of even the simplest beliefs. Our approach was to develop a database by coding homicide cases featured on *Forensic Files*. This enabled us to test a variety of crime scene beliefs. Although we found little support for most beliefs, some effects were significant.

The presence of overkill, or trauma inflicted beyond that which is necessary to cause death, predicted multiple perpetrators compared to a single stranger in several analyses. This effect remained when comparing multiple perpetrators to all single perpetrators. Interestingly, the relationship between multiple perpetrators and overkill is not a belief discussed in the *Crime Classification Manual* or the other sources we cited. Conversely, the frequently discussed belief that overkill predicts a closer relationship was not supported. In our analyses of overkill and closeness or familial relatedness, we found no significant effects of acquaintance vs. stranger, close relationship vs. stranger, family (non-genetic) vs. stranger, or genetic relative vs. stranger. Thus, the presence of overkill did not seem to have a significant relationship with knowing the victim. Even in the simplified analyses, just focusing on stranger vs. prior relationship, the effects remained non-significant. Therefore, we find no supportive evidence to this homicide belief. Overkill also did not predict the perpetrator's sex or if the crime was premeditated or not. Therefore, it was not the case that overkill indicated a spontaneous bout of murderous passion in the cases we examined.

No significant effects were found at $p < .05$ for relationship (closeness) or relationship (family). There was a marginal effect of no major trauma for family members. Additionally, the perpetrator was more likely to be a female than a male if there was no major trauma on the body. However, the results for location of major trauma are not as straightforward as in overkill. This is partially due to the covarying relationship of location of major trauma and manner of death, but also because of the reference category. For location of major trauma, we chose trauma not being localized as the reference group, as this yields a general trauma to specific trauma comparison. However, an argument could be made to use multiple major traumas as the reference group. The majority of results do not change significantly if this is used as the reference category. However, it is worth noting that when multiple major traumas is used as the reference group, predicting relationship (closeness), the effect of no major trauma and head trauma are significant effects ($p < .05$). Specifically, when the location of the major trauma(s) was localized primarily to the head or there was no major trauma, the perpetrator was more likely to have a close relationship compared to being a stranger. Additionally, when the location of the major trauma(s) was localized primarily to the neck, the perpetrator was more likely to be an acquaintance compared to being a stranger. Thus, in the case of location of major trauma(s), the results depend somewhat on the reference category. Therefore, these results remain highly preliminary.

Cause of death demonstrated several significant effects. First, in terms of relationship-closeness, when the cause of death was sharp force trauma, blunt force trauma, or asphyxiation, relative to shooting, the killer was more likely to be a stranger than an acquaintance. Similarly, when the cause of death was sharp force trauma or asphyxiation, relative to shooting, the killer was more likely to be a stranger than a close relationship. We also found a very small effect of relationship (family). Specifically, when the cause of death was sharp force trauma, the perpetrator was more likely to be a stranger compared to a family member. We also found that when the cause of death was asphyxiation, and to a lesser extent blunt force trauma, the perpetrator was more likely to be male, but when the cause of death was poison, the perpetrator was more likely to be female. This latter effect helps explain the finding of female perpetrators being more likely to leave no major trauma on the body as well as the marginal effect of no major trauma for family members. Indeed, an examination of these cases showed that when wives murder, they are disproportionately more likely to poison their husbands, which accounts for the family effect and the no major trauma effect. Finally, in terms of premeditation, we found that when the cause of death was due to multiple means, sharp force trauma, blunt force trauma, or asphyxiation, compared to shooting, the homicide was less likely to be premeditated. We also note the heavy degree of premeditation when the cause of death was poison. In fact, out of the 28 cases of poisoning, only two were not premediated. This low variance likely contributed to the lack of a significant effect here.

Although we could not test if covering the body was related to the remorse felt by the perpetrator, we did test if covering the body was related to having some prior relationship with the victim. In the relationship-closeness analyses and the relationship-family analyses, no significant effects were observed. Thus, covering or not covering the

body did not vary according to any specific type of relationship the perpetrator had with the victim. Even using a more simplified analysis of stranger vs. prior relationship, there were no significant effects. However, we did find that when the body was wrapped or in a container, this was strongly indicative of having been transported. Moreover, covering the body was also indicative of transporting the body, albeit to a lesser degree. This is clearly contrary to the belief in the *Crime Classification Manual* that covering the body and containing the body predict different aspects of the crime, but it does support the belief that containing the body is strongly related to transporting the body. In fact, this was a moderate to large effect (Cramer's $V = .481$; Cohen, 1988)

Regarding body position, although we could not test the specific beliefs discussed in the *Crime Classification Manual*, we did test possible effects such as relationship (closeness). For all effects regarding body position, we found no significant relationships. Therefore, we see no evidence that the position the body is in predicts anything about the perpetrator.

Although not covered in the *Crime Classification Manual*, there is the belief among some investigators that finding the victim nude suggests they were raped (Meshram & Nanandkar, 2013). Indeed, we found a significant and strong relationship between the body being partially nude or fully nude and the victim having been raped. This seems to be a case where intuition and reality indeed overlap.

***Implications and Future Directions***

Evidence here suggests that we should likely be skeptical of most crime scene beliefs, as they may reflect illusory correlations rather than empirically valid relationships (Chapman & Chapman, 1975; Snook et al., 2008). The tremendous cost of investigators following these beliefs should be clear: killers may never be caught, and innocent people may be sent to prison. This underscores the importance of testing assumptions whenever possible, whether it be the distinctness of partial fingerprints, or the presence of overkill at a crime scene.

Two promising findings were the relationship between wrapping/containing/covering the body and transporting the victim and finding the victim partially nude or nude being predictive of rape. In terms of the former effect, this may help investigators quickly identify that the location where the body was discovered is not the primary crime scene. Potentially, the quicker investigators realize this and discover the primary crime scene, the better they are able to preserve evidence. In terms of the latter effect, knowing that finding the victim nude or partially nude highly predicts rape, could help investigators better understand the motivation for the crime. More importantly, we found that rape strongly predicts stranger relationship with the victim. In other words, if the victim is found nude or partially nude, this highly suggests that the victim was raped or there was an attempted rape. In turn, evidence of rape predicts that the killer is much more likely to be a stranger rather than an acquaintance or close relationship. This is particularly useful given that perpetrators of sex offenses (without a homicide) tend to have a known relationship with the victim or are a family member, rather than a stranger (United States Federal Bureau of

Investigation, 2015d). This could potentially allow investigators, at a crime scene with a nude victim, to rule out close relationships like boyfriends and husbands and focus more on someone the victim just met or a complete stranger.

Although there were several promising effects, the majority tended to be nonsignificant, or significant with small effect sizes. For example, when cause of death was poison, relative to shooting, the odds that the perpetrator was male, compared to female, decreased significantly. Nonetheless, like all other causes of death we coded, if someone used poison, it was still more likely to be a male compared to a female. If an investigator relied on this information, they should be relatively more likely to suspect a female in the case of a poisoning, yet the base rate indicates that the perpetrator is more likely to be a male. In this case, one could argue that the investigator is still better off relying on the base rates. However, the criteria for a homicide belief to be considered sufficiently strong to be useful in an investigation is a separate empirical issue. Our goal here was simply to explore the accuracy of some of these beliefs.

Although we discussed several beliefs from the *Crime Classification Manual*, to our knowledge there is no data that indicates how close homicide investigators follow the manual or how training using the manual may affect officer's beliefs. Yet, given the potential for crime scene beliefs and intuitions to help or hinder an investigation, we encourage others to investigate these beliefs further and for the construction of more comprehensive homicide databases.

***Limitations***

We note several significant limitations of the present work, including the sample size and the representativeness of the data. Although we included 411 homicides, some categories could not be coded either because it was unclear from the presentation of the case or was completely missing in that particular episode of *Forensic Files*. As a result, the cell sizes for some analyses were too small to be reasonably tested. This again highlights the importance of creating larger homicide databases. Second, our data may not be representative of homicide in general. As we discussed earlier, the causes of death in our data were relatively similar to those in other published sources, yet there were some clear differences. For example, the frequency of rape and premeditation were disproportionately high in our data. We cannot reasonably say what effects these differences may have had. Arguably, it may have been advantageous to have rape victims overrepresented in these data, otherwise we might not have had sufficient cell frequencies to test the effects involving rape. A more general limitation is simply the use of a television documentary show to code data. Although there are other examples in the scientific literature (Ahmed, 2013; Eisenberg, Carlson-McGuire, Gollust, & Neumark-Sztainer, 2015; Levitt, 2004; Zhang & Chen, 2017), we must be very cautious about using this data in actual investigations.

We stress that all these results are highly tentative. Both the methodology and the analyses were exploratory. In terms of the latter, we conducted a large number of hypotheses tests, which of course inflates Type I error. Often, to control for Type I error, an adjusted p-value is used. We chose not to do this for two reasons. First, using a more stringent

p-value criterion can inflate Type II error, which is arguably more significant. Second, the purpose was to *explore* some of these beliefs and victim-perpetrator relationships. We therefore make no strong claims about the veracity of any effects and highlight that all require replication with independent data. Those significant effects which do not replicate, were likely Type I error.

### *Conclusions*

Commonsense or intuitive beliefs can powerful, and we often rely on them rather than empirical evidence. Yet even simple beliefs about the predicted motion of an object may be wrong, as has been demonstrated in research on naive physics (McCloskey, Caramazza, & Green, 1980; McCloskey, Washburn, & Felch, 1983). The beliefs concerning details of a crime scene and what they may indicate about a perpetrator are comparatively far more complex. We explored some of these homicide beliefs and although we did not find support for many, we did find that when the victim's body is wrapped or placed in a container, this was predictive of transporting the victim, and the nudity of the victim was predictive of rape. While this latter effect, for example, might be dismissed by some as obvious, it is for this very reason we find it critical to understand these beliefs. As this research progresses, we may find that while most of these beliefs are invalid, a few are valid and can become another reliable tool for homicide investigators. While these data are exploratory, we encourage investigators to consider what beliefs and intuitions they have, and to rely on evidence that has demonstrated probative value.

## REFERENCES

Aamodt, M. G. (2008). Reducing misconceptions and false beliefs in police and criminal psychology. *Criminal Justice and Behavior, 35*, 1231-1240. doi:10.1177/0093854808321527

Aamodt, M. G., & Custer, H. (2006). Who can best catch a liar? A meta-analysis of individual differences in detecting deception. *The Forensic Examiner, 15*, 6-11.

Ahmed, A. (2013). Co-ethnic preferences in a cooking game: A study based on "come dine with me" in Sweden. *Ethnic and Racial Studies, 36*, 2220-2236. doi: 10.1080/01419870.2012.729671

Ask, K. (2010). A survey of police officers' and prosecutors' beliefs about crime victim behaviors. *Journal of Interpersonal Violence, 25*, 1132-1149. doi:10.1177/0886260509340535

Bateman, A. L., & Salfati, C. G. (2007). An examination of behavioral consistency using individual behaviors or groups of behaviors in serial homicide. *Behavioral Sciences & the Law, 25*, 527-544. doi:10.1002/bsl.742

Bennell, C., Jones, N. J., Taylor, P. J., & Snook, B. (2006). Validities and abilities in criminal profiling: A critique of the studies conducted by Richard Kocsis and his colleagues. *International Journal of Offender Therapy and Comparative Criminology, 50*, 344-360.

Blank, H., & Launay, C. (2014). How to protect eyewitness memory against the misinformation effect: A meta-analysis of post-warning studies. *Journal of Applied Research in Memory and Cognition, 3*, 77-88. doi: 10.1016/j.jarmac.2014.03.005

Canter, D. V., Alison, L. J., Alison, E., & Wentink, N. (2004). The organized/disorganized typology of serial murder: Myth or model? *Psychology, Public Policy and Law, 10*, 293-577.

Chapman, L. J., & Chapman, J. P. (1975). The basis of illusory correlation. *Journal of Abnormal Psychology, 84*, 574-575. doi: 10.1037/h0077112

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: L. Erlbaum Associates.

Deffenbacher, K. A., Bornstein, B. H., Penrod, S. D., & McGorty, E. K. (2004). A meta-analytic review of the effects of high stress on eyewitness memory. *Law and Human Behavior, 28*, 687-706. doi: 10.1007/s10979-004-0565-x

DePaulo, B. M., & Pfeifer, R. L. (1986). On-the-job experience and skill at detecting deception. *Journal of Applied Social Psychology, 16*, 249-267. doi: 10.1111/j.1559-1816.1986.tb01138.x

Douglas, J. E., Burgess, A. W., Burgess, A. G., & Ressler, R. K. (2013). *Crime classification manual: A standard system for investigating and classifying violent crime* (3rd Ed.). Hoboken, New Jersey: John Wiley & Sons, Inc.

Dowling, P., Martin K.A., & Sherry, V. (Producers). (2010). Shoe-in for murder [Season 13 episode 41]. In *Forensic Files*. Allentown, Pennsylvania: Medstar Television.

Dowling, P. (Executive producer). (2010). *Forensic files* [Television series]. Allentown, Pennsylvania: Medstar Television.

Dror, I. E., Charlton, D., & Péron, A. E. (2006). Contextual information renders experts vulnerable to making erroneous identifications. *Forensic Science International, 156*, 74-78. 10.1016/j.forsciint.2005.10.017

Dror, I. E., Péron, A. E., Hind, S., & Charlton, D. (2005). When emotions get the better of us: The effect of contextual top-down processing on matching fingerprints. *Applied Cognitive Psychology, 19*, 799-809. doi: 10.1002/acp.1130

Eisenberg, M. E., Carlson-McGuire, A., Gollust, S. E., & Neumark-Sztainer, D. (2015). A content analysis of weight stigmatization in popular television programming for adolescents. *International Journal of Eating Disorders, 48*, 759-766. doi: 10.1002/eat.22348

Kelley, M. R., & Lemke, R. J. (2015). Gender differences when subjective probabilities affect risky decisions: An analysis from the television game show cash cab. *Theory and Decision, 78*, 153-170. doi: 10.1007/s11238-013-9389-9

Kleider-Offutt, H. M., Cavrak, S. E., & Knuycky, L. R. (2015). Do police officers' beliefs about emotional witnesses influence the questions they ask? Emotion and eyewitness memory. *Applied Cognitive Psychology, 29*, 314-319. doi: 10.1002/acp.3111

Kocsis, R. N. (2003a). Criminal psychological profiling: Validities and abilities. *International Journal of Offender Therapy and Comparative Criminology, 47,* 126-144. doi: 10.1177/0306624X03251092

Kocsis, R. N. (2003b). An empirical assessment of content in criminal psychological profiles. *International Journal of Offender Therapy and Comparative Criminology, 47,* 38-47. doi: 10.1177/0306624X02239273

Kocsis, R. N., Hayes, A. F., & Irwin, H.J. (2002). Investigative experience and accuracy in psychological profiling of a violent crime. *Journal of Interpersonal Crime, 17*, 811-823. doi: 10.1177/0886260502017008001

Levitt, S. D. (2004). Testing theories of discrimination: Evidence from 'weakest link'. *Journal of Law and Economics, 47*, 431-452. doi: 10.1086/425591

Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory, 12*, 361-366. doi: 10.1101/lm.94705

McCloskey, M., Caramazza, A., & Green, B. (1980). Curvilinear motion in the absence of external forces: Naïve beliefs about the motion of objects. *Science*, 210, 1139-41. doi: 10.1126/science.210.4474.1139

McCloskey M., Washburn, A., & Felch, L. (1983). Intuitive physics: The straight down belief and its origin. *Journal of Experimental Psychology: Learning, Memory and Cognition, 9*, 636-649. doi: 10.1037/0278-7393.9.4.636

Meshram, A. H., & Nanandkar, S. D. (2013). Rape victim autopsy: A case report. *Indian Journal of Forensic Medicine & Toxicology, 7*, 254-287.

Mokros, A., & Alison, L. J. (2002). Is offender profiling possible? Testing the predicted homology of crime scene actions and background characteristics in a sample of rapists. *Legal and Criminological Psychology, 7*, 25-43. doi: 10.1348/135532502168360

National Research Council. (2009). *Strengthening Forensic Science in the United States: A Path Forward*. Washington, DC: The National Academies Press. doi: 10.17226/12589

Otzen, T., Sanhueza, A., Manterola, C., Hetz, M., & Melnik, T. (2015). Homicide in Chile: Trends 2000-2012. *BMC Psychiatry, 15*, 312-316. doi: 10.1186/s12888-015-0632-5

Snook, B., Cullen, R. M., Bennell, C., Taylor, P. J., & Gendreau, P. (2008). The criminal profiling illusion: What's behind the smoke and mirrors? *Criminal Justice and Behavior, 35*, 1257-1276. doi: 10.1177/0093854808321528

Snook, B., Eastwood, J., Gendreau, P., Goggin, C., & Cullen, R. M. (2007). Taking stock of criminal profiling: A narrative review and meta-analysis. *Criminal Justice and Behavior, 34*, 437-453. doi: 10.1177/0093854806296925

Trojan, C., & Salfati, C. G. (2011). Linking criminal history to crime scene behavior in single-victim and serial homicide: Implications for offender profiling research. *Homicide Studies, 15*, 3-31. doi: 10.1177/1088767910397281

United States Federal Bureau of Investigation. (2015a). *Uniform crime report: Table 1* [Data file]. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2015/crime-in-the-u.s.-2015/tables/expanded_homicide_data_table_1_murder_victims_by_race_ethnicity_and_sex_2015.xls

United States Federal Bureau of Investigation. (2015b). *Uniform crime report: Table 3* [Data file]. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2015/crime-in-the-u.s.-2015/tables/expanded_homicide_data_table_3_murder_offenders_by_age_sex_and_race_2015.xls

United States Federal Bureau of Investigation. (2015c). *Uniform crime report: Table 20* [Data file]. Retrieved from https://ucr.fbi.gov/crime-in-the-u.s/2015/crime-in-the-u.s.-2015/tables/table-20

United States Federal Bureau of Investigation. (2015d). *National Incident-Based Reporting System: Relationship of Victims to Offenders by Offense Category* [Data file]. Retrieved from https://ucr.fbi.gov/nibrs/2015/tables/data-tables

Vrij, A., & Mann, S. (2001). Who killed my relative? Police officers' ability to detect real-life high-stake lies. *Psychology, Crime & Law, 7*, 119-132. doi: 10.1080/10683160108401791

Wright, M. (2013). Homicide Detectives' Intuition. *Journal of Investigative Psychology & Offender Profiling*, *10*(2), 182–199. doi: 10.1002/jip.1383

Zhang, Y., & Chen, L. (2017). Exploration of factors leading to successful mediation: A regression analysis of reality TV mediation show episodes in China. *International Journal of Conflict Management, 28*, 24-49. doi: 10.1108/IJCMA-12-2015-00

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