

The Jack the Ripper Murders: A *Modus Operandi* and Signature Analysis of the 1888–1891 Whitechapel Murders

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Abstract

A number of females, commonly recognized as 11 victims, were murdered in separate events in Whitechapel, London between 1888 and 1891. An evaluation of the murders revealed that six of those murders were linked by a number of distinct, personal signature characteristics, including picquerism, overkill, incapacitation, domination and control, open and displayed, unusual body position, sexual degradation, mutilation, organ harvesting, specific areas of attack, preplanning and organization, and a combination of signature features. The signature characteristics observed in these infamous Jack the Ripper murders were compared to a 1981–1995 cohort of 3359 homicide cases from Washington State's HITS database. The analysis revealed that the signature displayed in six of the Whitechapel murders was extremely rare. There were only six records of female victims, one a prostitute, with probed, explored, or mutilated body cavities. There were only two cases, both females who were not prostitutes, where the body was left in an unusual position and body cavities were explored, probed, or mutilated. Copyright © 2005 John Wiley & Sons, Ltd.

Key words: forensic science; serial murder; signature murder; criminal profiling; crime scene assessment; picquerism; *Jack the Ripper*

INTRODUCTION

Between 1888 and 1891, 11 female victims were murdered in the Whitechapel area of London. At the time, it was not known which of the crimes had been committed by the same killer. To date, there is still wide debate on which victims can be attributed to the same murderer. Following the surmise of some investigators at that time (Evans & Skinner, 2000: p. 585), it has been frequently cited that the same assailant committed five of the

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known Whitechapel murders (Abrahamsen, 1992; Begg, Fido & Skinner, 1996; Canter, 2003; Evans & Gaine, 1998; Fido, 1993; Gordon, 2001; Smithkey, 1998; Sugden, 2002).

The purpose of this article is to link the murders committed in the series by the unknown murderer, popularly called *Jack the Ripper*. Modern crime scene assessment procedures, including signature analysis, were conducted on the 11 murders in order to determine which cases may be linked by crime scene characteristics and to establish the signature of the killer. The crime scene assessment and signature analysis were based on recently released Scotland Yard case files, inquest reports, police records, crime scene photographs, and sketches contained in the sources cited in this paper. References to newspaper articles contained in the sources were avoided due to lack of substantiation. The authors recognize that these sources are incomplete by today's standards, making the application of modern crime scene assessment procedures more difficult. However, the authors will not engage in speculation based on absent information, but will rely on the existing crime scene information.

In addition, the relative rarity of signature characteristics displayed in the Whitechapel murders was assessed based on an analysis of a modern database of all murders in Washington State between 1981 and 1995 ($n = 3359$). The objective was to determine which Whitechapel murders, sharing a set of distinct characteristics, were likely to be connected to one another and committed by the same killer. The details and evidence described will show that a serial killer murdered *six* of the women among the 11 Whitechapel murder victims.

BACKGROUND

In spite of the apparent rampant crime in the area, there is some confusion about the prevalence of murder. The Annual Report of the Sanitary Conditions of Whitechapel listed no murders in the Whitechapel area in the years 1886 and 1887. The report listed only 71 cases of violent death in the Whitechapel area in 1887; 69 of those deaths were attributed to accidents and the remaining two were suicides. Only one murder was recorded for the entire Whitechapel area in 1889 and again in 1890 (Paley, 1996). This suggests that while the Whitechapel area was crime laden, the occurrence of murder was rare.

However, other analysts (Emmerichs, 2001) have shown that murders in Whitechapel were likely more common and typical of other high crime rate areas in London. There are a number of reasons for this. Record keeping was not systematic, the classification of cause of death was rudimentary, haphazard, and often inaccurate, the official residence of the victim had to be in Whitechapel to be counted, and the poverty of the residents and victims (referred to at the time as members of the 'dangerous classes') militated against any official legal action. Analyses of nineteenth century London coroners' records indicate that it was unusual for a coroner to classify suspicious homicides as murders. Coroners were paid by a Justice of the Peace for their investigations, which were typically not requested because they were considered unnecessary. Coroners were not required to have a medical background until 1926, so they were often involved in occupations other than medicine. Emmerich's (2001) examination of hundreds of inquests performed in the nineteenth century in London indicates that the criminal homicide rate was much higher than reported in the sparse and unreliable documents of the time.

The 11 Whitechapel murders examined in this paper occurred over a 10-month time span (Table 1).

Table 1. Timeline of Whitechapel murders

Date	Victim	Location
Tuesday 3 April 1888	Smith	Assaulted and robbed, Osborne Street, Whitechapel
Tuesday 7 August 1888	Tabram	George Yard Buildings, Whitechapel
Friday 31 August 1888	Nichols	Yard crossing on Bucks Row, Whitechapel
Saturday 8 September 1888	Chapman	Back yard of No. 29 Hanbury Street, Spitalfields
Sunday 30 September 1888	Stride	Inside gates of Duffield's Yard in Berner Street, St. Georges-in-the-East
Sunday 30 September 1888	Eddowes	Mitre Square, Aldgate, City of London
Friday 9 November 1888	Kelly	Apartment at No. 26 Dorset Street, Spitalfields
Thursday 20 December 1888	Mylett	Clarkes Yard, High Street, Poplar
Wednesday 17 July 1889	McKenzie	Castle Alley, Whitechapel
Tuesday 10 September 1889	Unknown	Under railway arch, Pinchin Street, St. Georges-in-the-East
Friday 13 February 1891	Coles	Roadway in Swallow Gardens, Royal Mint Street, Whitechapel

The primary questions are: Were the 11 murders the work of the individual referred to as *Jack the Ripper*? Or, was it some subset of the total number of possible Ripper victims? If so, how many? Which ones? How are they linked? Before those questions are answered, each of the cases will be described briefly.

Details of the Emma Elizabeth Smith case

On 3 April 1888, between 4:00 and 5:00 a.m., Emma Elizabeth Smith returned to her common lodging house at No. 18 George Street, Spitalfields. She had been assaulted and robbed at approximately 1:30 a.m. on 3 April while passing Whitechapel Church. With the help of two neighbors, Smith walked to the London Hospital where she died at 9:00 a.m. on 4 April from injuries sustained in the attack (Gordon, 2001; Evans & Skinner, 2001). Smith, a white female, was 45 years old and 5 feet 2 inches tall with a fair complexion and light brown hair (Evans & Skinner, 2000).

The offense was committed on the pathway opposite No. 10 Brick Lane, located 300 yards from the victim's residence and half a mile from the London Hospital. Statements made by Smith prior to her death indicated that the motive for the attack was robbery by three attackers (Evans & Skinner, 2000; 2001).

The coroner determined that her head had been bruised and her right ear torn. Her abdomen was injured and her peritoneum was penetrated by a blunt instrument thrust up her 'woman's passage.' Other internal organs were ruptured and great force had appar-

ently been used to cause the injuries. Her death was attributed to peritonitis, due to the rupture of the peritoneum (Evans & Skinner, 2000).

Details of the Martha Tabram case

About four months after the murder of Emma Smith, the body of a fully clothed woman was found lying on her back with her clothes disarranged at approximately 4:45–4:50 a.m. on a first floor landing at the George-yard-buildings, Working Lads' Institute, Whitechapel. The victim, a white female, was identified as Martha Tabram, sometimes known as Martha Turner. Tabram resided at No. 19 George Street, a common lodging house, under the name of Emma, and was known to be a prostitute and heavy drinker. Tabram was approximately 36 years old, well nourished, 5 feet 3 inches tall, with dark hair and a dark complexion. She was wearing a dress, green skirt, brown petticoat, long black jacket, brown stockings, side-spring boots and a black bonnet (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

Tabram's body was found face-up in a pool of blood. Her clothing was arranged to leave the lower part of her body exposed, and her legs were lying open. There were no footprints, weapons or blood on any of the stairs leading to the landing. Blood evidence was consistent with an inspector's determination that she had been murdered in the exact spot she was found. There was a concentration of blood at the site where the body was found and no visible drag marks or evidence that the body had been moved (Evans & Gainey, 1998; Evans & Skinner, 2000).

A resident left the George-yard-buildings around 4:45–4:50 a.m. for work. When he reached the first floor landing he found Tabram lying on her back in a pool of blood. He called for the police. He didn't see any blood, footprints or weapons on the staircase, but noticed the victim's hands were clenched and her clothing disheveled (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The coroner was called to the scene of the murder and found that Tabram had approximately 39 stab wounds, many concentrated on the left side of her body. Nine were in her throat; 17 in her breast, and the others were in the lower parts of her body. She had been deceased for about three hours at that time, placing the time of death sometime between 2:00 and 4:50 a.m. The left lung had been penetrated in five places and the right lung had been penetrated in two places. The heart was penetrated once, which was sufficient to cause death. The liver was penetrated in five places, the spleen in two places, and the stomach in six places. The doctor also identified wounds to the neck, the genitals, and a wound that penetrated the chest bone. The wounds did not appear to be from the same instrument. The wounds were consistent with penetration by a knife or dagger. All of the wounds were inflicted before death (Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000).

Details of the Mary Ann Nichols case

The murder of Mary Ann Nichols occurred on Friday, 31 August 1888. Her body was found between 3:40 and 3:45 a.m. on a secluded yard crossing/footway at Bucks Row, Whitechapel by two car-men. The victim was dressed and lying on her back with her clothes pushed up almost to her stomach, which one of the witnesses pulled back down to her knees (Evans and Skinner, 2000: p. 42). Her throat had been slashed from ear to ear (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2001; Begg, 2003).

Believing the victim to be alive, the car-men notified a constable. While they were in the process of notifying the constable, another constable found Nichols, at approximately 3:45 a.m. as he was walking down the right side of Buck's Row towards Brady Street. The constable found the victim lying in the street, outside a gateway with her head towards the east. The gateway (which led to some stables and was 9–10 feet in height) was closed. Houses ran eastward from the gateway, with a boarding school west of the location (Evans & Gainey, 1998; Evans & Skinner, 2000; Begg, 2003).

Mary Ann Nichols, a known prostitute, was about 43 years old. She was about 5 feet 2 inches tall, with brown or grey eyes, a dark complexion and dark brown, graying hair. She had been a workhouse inmate, chargeable to the Parish of Lambeth after 1882 (Evans and Skinner, 2000: pp. 24, 29). Her face was bruised and discolored, and she was known to drink fairly heavily. She had been separated from her husband for nine years (Evans & Gainey, 1998; Gordon, 2001; Smithkey, 1998; Sugden, 2002; Begg, 2003).

The body was lying lengthways with the left hand touching the gate. The body was warm and blood was oozing from a wound in her throat. Nichols's bonnet was lying to the right side of her body, close to her left hand, and her clothing was disarranged. The back of her coat was drenched in blood. The killer had left her body open and exposed to be quickly discovered (Evans & Skinner, 2000).

At the time of her death, Nichols was wearing a brown dress, a brown linsey frock with a gray woollen petticoat, white chest flannel, brown stays, white chemise, black ribbed woollen stockings, man's S.S. boots with a cut on the uppers and tips on the heels, and a black straw bonnet trimmed with black velvet. The victim also had in her possession a looking glass, comb and a white handkerchief (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000).

The post mortem examination left no doubt that the murder was committed where the body was found. No signs of struggle or drag marks were found. A search of the area was conducted, but no murder weapon or markings on the road made by wheels were found (Evans & Gainey, 1998; Evans & Skinner, 2000; Begg, 2003).

Nichols was last seen, in a state of drunkenness, on 31 August at 2:30 a.m. at the common-lodging, No. 18 Thrawl St, at the corner of Osborne St and Whitechapel Road. The witness indicated that the victim did not have any money and was going out in an attempt to make the money needed for lodging for the night. The victim was seen alone. No witness accounted for her presence after 2:30 a.m. until her body was found at 3:45 a.m. Witnesses did not hear any screams or noise (Evans & Gainey, 1998; Evans & Skinner, 2000; Begg, 2003).

The coroner determined that Nichols's throat was cut from left to right. Two distinct cuts were on the left side of the throat. The windpipe gullet and spinal cord were cut through. The throat was cut so deeply, it nearly severed the head from the body. The incision was about 8 inches in length and appeared to have been caused by a long bladed, sharp knife. A bruise was located on her lower right jaw. Another bruise was located on her left cheek. Both bruises were consistent with being caused by a fist, thumb or fingers. The tongue was slightly lacerated. Five teeth were missing. There were no bruises found on the victim's arms to indicate a struggle had taken place (Gordon, 2001; Evans & Skinner, 2000; Begg, 2003).

There was no blood found on the breast, body or clothing. The abdomen had been jaggedly cut open from the center of the bottom of the ribs along the right side, under her pelvis to the left of her stomach. The coating of the stomach was cut in several places. No viscera were missing. There were two stab wounds on her 'private parts'. There was some

question as to whether the perpetrator was left handed as reported in the first police report. The coroner believed the abdominal injuries were inflicted first and caused instantaneous death. The time of death was estimated as between 3:15 and 3:45 a.m. on 31 August 1888. The physical evidence supported the finding that she had been murdered in the exact spot where she was found. The blood evidence suggested that the wound to the neck occurred before the injuries to the abdomen and that many of her injuries were sustained while she was on the ground (Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

Details of the Annie Chapman case

The murder of Annie Chapman occurred in the early morning hours of Saturday, 8 September 1888. The time of death is not clear, because of conflicting accounts given by witnesses. In one of the police inspector's reports, it is stated that a man was passing through Bucks Row on his way to work at about 3:40 a.m. on 8 September when he saw a woman lying on her back in the walkway leading to the stable yard. He called out to a passerby, both of whom went to find a constable. When the constable arrived at the scene, another one had already discovered the body. The first constable sent for Dr Llewellyn, who pronounced the woman dead and called for the removal of the body to the mortuary (Evans & Gainey, 1998; Evans & Skinner, 2000; Sugden, 2002). Unfortunately, this account does not indicate the times the constables arrived on the scene, nor the time the body was removed.

This account is different to the one contained in the inquest documents, which suggests that the victim may still have been alive after 3:40 a.m. A local resident went out on the back porch of No. 29 Hanbury Street at 4:45 a.m. and did not notice a body, while another reported that he heard noises at 5:25 a.m. over the fence in the yard. At 5:30 a.m. a woman stated that she saw a man and woman talking near No. 29 Hanbury Street. She later identified that woman as the deceased (Begg, 2003; Evans & Gainey, 1998; Evans & Skinner, 2000; Gordon, 2001). However, a body was not discovered until 5:45 a.m., by another resident of No. 29 Hanbury Street, when he went down the steps into the yard. He found the body of a dead woman lying on her back. A different police inspector was notified at 6:10 a.m. that a woman's body had been found. This inspector called for another doctor, Dr Phillips the division surgeon, who arrived at the scene at 6:30 a.m. He opined that the woman had been dead for at least two or three hours, which would place the time of death between 3:30 and 4:30 a.m. (Evans & Skinner, 2000; Sugden, 2002). Of course, this calls into question the accuracy of the accounts of those witnesses identified in the inquest reports, and lends some credence to the competing description of events. Neither one is compelling. Suffice to say, Annie Chapman was killed in the darkness of morning.

She was a widow between the ages of 45 and 47 years old, 5 feet tall, with a fair complexion and wavy dark brown hair and blue eyes. She was missing two teeth in her lower jaw and had a large thick nose. She was apparently malnourished, had tuberculosis and possibly syphilis. She was dressed in a black figured jacket with a brown bodice, black shirt, striped petticoat, lace boots, and a crepe bonnet. Her clothing was old, dirty, and bore the mark of Lambeth Workhouse. A bloody handkerchief found around her neck was later identified as her own. Two brass rings that the deceased commonly wore were missing. She was known to work as a prostitute and had lodged at the Crossingham Lodging house at No. 35 Dorset Street, Spitalfields.

The victim was discovered lying on her back, two feet from the back wall of the house. Her head was facing toward the wall. The body was approximately 6–9 inches from the steps. There were six patches of blood varying in size from a sixpenny piece to a point. Head patches and smears of blood appeared about 14–18 inches above the ground on the wooden palling to the left of her body. There was blood on the inside of the neck of her jacket and drops of blood on her left sleeve, consistent with the injury to her neck. In addition, there were a few droplets of blood spattered on her stockings, likely from the wounds inflicted to her abdomen after she was on the ground. There was no evidence of a struggle in the yard. No weapons were recovered at the scene of the murder. A wet leather apron was lying in the yard about 2 feet from the water tap (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000).

At approximately 1:40 a.m., Chapman had been seen in the kitchen at No. 18 Thrawl Street, when she informed the deputy that she had no money to pay for her lodgings and requested that the bed be kept for her. She was drunk at the time. A fellow lodger last saw Chapman at the corner of Osborne Street and Whitechapel Road. The church clock had chimed 2:30 a.m., so there was no confusion about the time. It is important to note that the distance from Osborne Street to Bucks Row was approximately half a mile (Gordon, 2001; Evans & Skinner, 2000; Begg, 2003).

The victim's swollen face was turned to the right side with her tongue protruding beyond her teeth, but not out of her mouth. There was a bruise over her right temple and a bruise on the upper eyelid. There were two distinct bruises on the forepart of her chest. Each was the size of a man's thumb. Her left arm was resting on her left breast and her legs drawn up. Her hands were raised and bent with the palms towards her upper body as though she had reached for her throat. There was a bruise on the middle of her right hand (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

Her small intestines were abducted, and the flap of the abdomen was lying above the right shoulder attached by a cord, with the rest of the intestines inside the body. Two flaps of skin from the lower part of the abdomen were lying in a large quantity of blood above the left shoulder. Her throat was cut deeply from the left and back in a jagged manner right around the throat. The markings were consistent with the deceased being seized by the throat while the cuts were made. Her fingers bore marks of abrasion on the first phalanx of the ring finger with distinct markings of rings being visible on the proximal phalanx of the same finger. This suggested evidence of having rings removed from the fingers by force (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The following body parts were missing: part of the belly wall including the navel, the womb, the upper part of the vagina, and a greater part of the bladder. The manner of removal of viscera suggested to the coroner that the murderer had anatomical knowledge. The knife used was not an ordinary knife, but an amputating knife or a well ground slaughter man's knife. The knife was narrow and thin with a sharp blade, approximately 6 to 8 inches in length (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; 2001).

The physical evidence suggested that the perpetrator seized the victim from behind, by the chin and pressed her throat. This would have produced unconsciousness and suffocation. There was no evidence of a struggle or sexual assault. Then the victim was lowered to the ground and laid on her back. Her throat was then cut from left to right in two places, injuries were sustained to the abdomen, and her uterus was taken from the womb (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000).

The contents of her pockets were emptied and arranged in order at her feet. The little care taken with the ring removal suggested that the perpetrator was interrupted. The injuries to the viscera were not necessary since the loss of blood at the neck resulted in death (Evans & Skinner, 2000).

Details of the Elizabeth Stride case

The body of a woman was found inside the gates of Dutfield's Yard at No. 40 Berner Street, commonly referred to as the Berner Street Club, at the corner of Commercial Road East in St Georges-in-the East, at approximately 1:00 a.m. on Sunday, 30 September 1888 by a club steward. The body was lying in a pool of blood near the open gateway on the left side. The feet of the victim were about 6 or 7 feet from the gate. The head was facing towards the club wall (Evans & Gainey, 1998; Gordon, 2001; Smithkey, 1998; Sugden, 2002; Evans & Skinner, 2000).

The left arm of the victim was extended from the elbow, cachous lying in hand. The right arm was over the stomach. The back of her hand, and inner surface of her wrist were dotted with blood. Her legs were drawn up with her knees fixed so her feet were close to the wall. The body was still warm. There was a silk handkerchief around her throat, which was slightly torn corresponding to the angle of her right jaw. Her throat was deeply gashed and there was an abrasion on the skin about an inch and a quarter below the right brow. Her clothing appeared undisturbed. There was no sign of struggle. No murder weapon was found at the scene. No footprints or blood marks on the wall were found at the scene. There was a piece of paper doubled up in the victim's right hand. The victim was carrying a small piece of lead pencil, a key, thimble, two pocket handkerchiefs, a pocket comb, a piece of wool on a card, a broken piece of comb, a metal spoon, some buttons and a hook (Sugden, 2002; Evans & Skinner, 2000).

The victim was identified as Elizabeth Gustafsdotter Stride, alias 'Long Liz,' a known prostitute. She was Swedish, about 45 years old, with a pale complexion, light gray eyes, dark, curly hair, and approximately 5 feet 3 inches tall. She was wearing an old, long, black jacket trimmed with fur and a red and white flower pinned to it, two light serge petticoats, white stockings, white chemise with insertion in front, side spring boots, and a black crepe bonnet. She also had a colored silk handkerchief around her neck. The victim was missing her upper teeth at the front. She had a black mark from an old adder bite on her leg and a hollow on the bottom of her foot as a result of an accident (Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The victim was found lying on her left side with her head resting in the line of the carriage way. Her legs were drawn up and her feet were against the wall of the right side of the passage. The neck, chest, legs and face were slightly warm, but her hands were cold. The right hand was open, lying on her chest, and was smeared inside and out with blood. The left hand was partially closed, lying on the ground, and contained a small packet of sweets wrapped in tissue paper. There were no rings or marks on any of the fingers. The face was placid with the mouth slightly open. A silk scarf was around the neck, with the bow on the left side pulled tightly. There was a long incision in the neck corresponding with the lower border of the scarf. The lower edge of the scarf was frayed as if by a sharp knife. The incision at the neck commenced on the left side about 2.5 inches from the jaw line. It severed the vessels on the left side about 1.5 inch below the jaw line (Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

No blood was found on any of the clothing. The victim's bonnet was lying on the ground

a few inches from her head and the dress was undone at the top. The victim bled out slowly and could not have called out for help after the windpipe was severed. The murderer may have taken hold of the back of the scarf and pulled the victim backwards, but it was impossible to determine if the victim was standing when her throat was cut (Evans & Skinner, 2000; Begg, 2003).

Details of the Catherine Eddowes case

The body of a woman was found by a police constable at Mitre Square, Aldgate, City of London at approximately 1:45 a.m. on Sunday, 30 September 1888. The victim was lying on her back in a pool of blood. Her feet were facing the square and her clothing was pulled above her waist (Evans & Gainey, 1998; Smithkey, 1998; Evans & Skinner, 2000; 2001; Begg, 2003).

Three small black metal buttons (a type used for women's boots) were found on the left side of the victim. A common metal thimble and a small mustard tin containing two pawn tickets were also found at the scene. The victim had no money on her. A portion of the apron she was wearing had been cut through and was found inside her dress. Her head, neck, and shoulders were lying in a pool of uncongealed blood. No footsteps were present and no evidence of a struggle was found at the scene. Another part of the victim's apron was found at 2:20 a.m. on Gouldstone Street. At the spot where the apron was found, the words 'The Juwes are the men That Will not be Blamed for nothing' were written in chalk on the wall (Evans & Gainey, 1998; Gordon, 2001; Smithkey, 1998; Sugden, 2002; Evans & Skinner, 2000; 2001; Begg, 2003).

The victim was identified as Catherine Eddowes, alias Conway. Her age was estimated as between 43 and 46 years old. She was not a prostitute at the time, but was given to drinking. She earned a living by cleaning and hawking on the streets. She was 5 feet tall and had auburn hair and hazel eyes and the letters TC tattooed in blue ink on her left forearm. She was wearing a black straw bonnet, black cloth jacket, chintz skirt, brown linsey dress bodice, grey stuff petticoat, green alpaca skirt, ragged blue skirt with red flounce, white calico chemise, man's white vest and a pair of man's lace-up boots. Around her neck was a piece of red gauze silk with cuts. She also had quite a few knick-knacks in her possession, such as a bloody handkerchief, linens, rags, two clay pipes, and a comb, among other things (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The body appeared to have been posed. The victim was lying on her back with the head turned to the left shoulder. The arms were by her side as if they had fallen there with the palms upward. A thimble was lying off the finger on the right side. The clothes were drawn up over the abdomen and her thighs were naked. There was great disfigurement of her face and her throat was cut, with a neckerchief tied below the cut. Her intestines were drawn out and placed over her right shoulder and smeared with fecal matter. One piece of intestine was detached from her body and placed between her body and left arm. The lobe and auricle of her right ear was cut obliquely through. There was blood clotted on the pavement and her body was warm indicating that she may have been dead for approximately half an hour (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Evans & Skinner, 2001).

The autopsy report showed that the body was missing the left kidney and the uterus, but the mutilation gave no evidence that it was done by a skilled hand. The left renal artery was also severed. The mortuary examination revealed a green discoloration over the abdomen of the victim and a bruise the size of a six-pence on her left hand. There were

several cuts on the face and a deep cut into the bridge of her nose. The tip of the nose and a portion of her lip were cut off. Her throat was cut to the vertebrae. The cause of death was determined to be the severance of the left carotid artery. Death was immediate and the mutilation to the body was performed after death.

Several stab wounds were present, one in the liver and another in the left groin. The left kidney had been carefully removed. The vagina and cervix of the womb were uninjured, but the majority of the womb was removed. A sharp knife, about 6 inches in length, inflicted the wounds (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000).

Details of the Mary Jane Kelly case

On Friday, 9 November 1888 the mutilated body of a woman was found inside a room of a house at No. 26 Dorset Street, Spitalfields at approximately 10:45 a.m. The victim was identified as Marie Jeanette Kelly or Davies, commonly known as Mary Jane Kelly, a known prostitute. Kelly was 24–25 years old, 5 feet 7 inches tall, slim, blonde headed, of fresh complexion and attractive. She was known to drink heavily, but was not known to be helpless when she drank. She was last seen wearing a red pelerine, a dark shabby skirt, a velvet bodice and a shawl (Evans & Gainey, 1998; Gordon, 2001; Smithkey, 1998; Evans & Skinner, 2000; Begg, 2003).

The entrance to the apartment of the deceased was located between No. 26 and No. 28 Dorset Street at the end of a cul-de-sac known as Miller's court. The apartment was located on the ground floor of a three-storey house. In the court, there were six houses let out in tenements. On the right side of the passage, there were two doors, the first leading to the upper floors. The second door opened into Kelly's apartment. The apartment was about 15 feet square and was located towards the back of the building. There were two windows looking into a yard. Opposite the yard, was a side wall formed by houses. On the left side of the court, it was possible to secure a view in a diagonal direction of the larger window and the doorway belonging to the victim. There was a bed behind the door and parallel to the window. The only other furniture was a table and two chairs. A window was broken and blood was on the glass (Sugden, 2002; Evans & Skinner, 2000).

The victim was stretched out on the bed, lying on her back, and had been mutilated. Her nose and ears had been cut off and the flesh had been stripped off of her body leaving the skeleton. One or more organs appeared to be missing. Some of the body parts had been excised and placed on the table. She had been disemboweled and her organs placed around her. There was comparatively little blood at the scene and death appeared to be caused by the severing of the throat. A large knife had been used, but no weapon was found. There was no sign of a struggle. Women's garments had been carefully arranged and placed by the fireplace (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The surface of her abdomen and of her thighs were removed, and her abdominal cavity had been emptied of viscera. The uterus and kidneys were found, along with one breast, under her head. Her other breast was found by her right foot, and her liver between her feet. Her intestines were placed by her right side and her spleen was placed by the left side of her body. The flaps removed from her abdomen and thighs were found on the table. Her face was mutilated beyond recognition and her neck was severed to the bone. Further examination revealed that pericardium had been opened and her heart had been removed. Her heart was not present at the scene (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The victim was wearing a linen undergarment. The bed linens were saturated with blood. There was a pool of blood covering two square feet on the floor beneath the bed. The wall by the right side of the bed, in line with the victim's neck, was marked with blood in a number of separate splashes (Evans & Gainey, 1998; Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The coroner reported that the face of the victim was gashed in all directions. The nose, cheeks, eyebrows and ears were partially removed. The lips were blanched and cut with several incisions. There were a number of cuts across all features. The neck was cut to the vertebrae and the 5th and 6th vertebrae were deeply notched. The skin cuts in front of the neck showed distinct ecchymosis. The air passage was cut at the lower part of the larynx through the circoïd cartilage (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000).

Both breasts were removed by circular incisions; the muscles down to the ribs were attached to the breasts. The skin and tissues of the abdomen from the coastal arch to the pubic area were removed in large flaps. The right thigh was denuded in front to the bone, including the external organs of reproduction and part of the right buttock. The left thigh was stripped of skin, fascia and muscles to the knee. The left calf showed a long gash through skin and tissues to the deep muscles and reached past the knee to five inches above the ankle.

Both arms and forearms had extensive and jagged wounds. The right thumb had a superficial incision about one inch long and there were abrasions on the back of the hand. The lower part of the right lung was broken and torn away, the left lung was intact. Some of the mutilations had been performed post mortem. The cause of death was attributed to blood loss from the severed right carotid artery (Evans & Gainey, 1998; Gordon, 2001; Smithkey, 1998; Sugden, 2002; Evans & Skinner, 2000).

Details of the Rose Mylett case

The body of another woman was discovered by a constable in Clark's Yard on High Street in Poplar on 20 December 1888, at approximately 4:00 a.m. The body was still warm, indicating that she had not been dead long. The victim's face was placid with her eyes and mouth closed. The body was lying on its side in a position of natural repose, her arms at rest with her hands open. Her clothing was not disarranged, and a loosely folded handkerchief was around her neck, but not tied. There was a small, empty vial in her pocket. One of her earrings was missing. There were no signs of struggle and no marks of violence. The body was apparently moved from the scene before marks of strangulation could be found. The victim was later identified as Rose Mylett alias Catherine Millett, Lizzie Davis or Davies, and sometimes known as 'Drunken Lizzie Davis' by friends (Gordon, 2001; Evans & Skinner, 2000).

Mylett had not been seen by her family for over a week before her death. Mylett, a known prostitute, was last seen in the company of two sailors early in the morning of her death at 7:55 p.m. She evidently angered the sailors when she refused to accompany them. She was sober at the time (Gordon, 2001; Evans & Skinner, 2000).

Although there was some speculation that it was an accidental death, the coroner concluded that the victim had been strangled with a thin four-lag cord. Marks of strangulation were visible on the throat and neck. Considerable force had been used, but no mutilation was present (Gordon, 2001; Evans & Skinner, 2000).

Details of the Alice McKenzie case

The body of a woman was found on 17 July 1889 shortly after 12:48 a.m. at the bottom of Castle Alley in Whitechapel. It was raining heavily at that time. The body was still warm. Her throat had been cut and she was laying on her right side with her clothing pulled up to her waist exposing her abdomen. Her eyes were open and her pupils were dilated. Part of the top of her thumb was missing as well as a tooth in the upper jaw. There was a pool of blood under her head in the footway. When the body was removed, the location was searched and an old clay pipe smeared with blood and a farthing were found lying under the body.

The woman was later identified as Alice McKenzie, a known prostitute. She was approximately 39 or 40 years old and 5 feet 4 inches tall. She had a pale complexion and brown hair and eyes. She was known to drink and smoke. She was wearing a red dress with a stuff bodice, patched under the arms and sleeves with maroon colored material. She had one black and one maroon stocking, a brown stuff skirt, kilted brown linsey petticoat, white chemise and apron, paisley shawl and button boots; all old and dirty. Witnesses had passed through Castle Alley at 12:20 a.m. and 12:30 a.m., and not seen the body, which placed the time of murder between 12:30 and 12:34 a.m. (Evans & Gainey, 1998; Gordon, 2001; Evans & Skinner, 2000).

The coroner concluded that the injuries and cuts were not as severe as the previous cases. The knife was plunged deeply into the neck on the left side of the victim below the sterno mastoid muscle and brought out by a tailored incision just above the larynx on the same side. There were two stab wounds and some superficial cuts. The two main cuts were about 3 inches long and appeared to be inflicted by a sharp knife. No opinion could be given as to the length of the knife. The cuts were made from the front while the woman's head was thrown back above the ground. There were two bruises high up on the chest, which suggested that the murderer made the cuts with his right hand while he held the woman with his left hand. There were no bruises on the woman's face and neck (Evans & Skinner, 2000).

There was a jagged incision made up of several cuts extending from the chest to below the belly button. The incision extended through the skin and the subcutaneous fat. At the bottom of the cut, there were seven or eight superficial scratches about 2 inches long, parallel to each other in a longitudinal direction. The abdominal cavity was not opened. There was a small cut an eighth of an inch deep and a quarter of an inch long on the mons veneris. There were multiple cutting marks in the pubic area. They appeared to be inflicted by a right-handed person while he lifted her clothing. A small bruise was located on the left side of the stomach. The eyes and sex organs were mutilated. The throat wound caused immediate death. Due to the warmth of her body at discovery, the time of death was estimated to be close to 12:40 a.m. on 17 July 1889 (Evans & Skinner, 2000).

Details of the unknown woman case

On Tuesday, 10 September 1889, a female torso was found under a railway arch in Pinchin Street, St Georges-in-the-East, at approximately 5:20 or 5:30 a.m. There was no evidence of any blood or footmarks at the scene. The trunk was identified as belonging to a woman between 35 and 40 years old. The woman would have been about 5 feet 3 inches tall, with a stout build. She had a dark complexion and her hair was dark brown. Both elbows were

discolored as if from a habit of leaning on them, but her nails were well groomed (Gordon, 2001, Evans & Skinner, 2000).

No items used to transport the trunk were left at the scene. The area was remote; no habitations were located in the area. The area was faced by a wooden fence and flanked by a dead wall. The arch was the only one left open; the others were boarded or covered with doors (Paley, 1996). A portion of a blood-stained undergarment was found at 7:30 a.m. in a vacant yard on Hooper Street, 500 yards away. The stains on it were old and dried, matching the stains on the chemise on the torso.

About 18 feet from the roadway and about a foot from the right wall of the arch, the remains were laying face down, with the head and legs removed. The head of the body had been cut off by clean right-handed cuts. The vertebrae had been 'jointed' with blood oozing from them. Both legs had also been 'jointed' by right hand cuts, but dismemberment had taken place earlier than the dismemberment of the head since the raw flesh had dried and been blackened by exposure. The wound beginning on the lower part of the sternum, cutting through the skin and fatty substance, penetrated the bowels and uterus slightly and extended to the left side of the labia major. There were marks on the waist that appeared to have been caused by a rope post mortem. The trunk showed signs of decomposition (Evans & Skinner, 2000).

A chemise on the torso was cut at the arms and down the front. There was a small semi-circular cut on the index finger of the right hand, and bruises on both arms. A ring may have caused the marking on the fingers. There was nothing on the trunk which could identify the victim (Evans & Skinner, 2000).

The surroundings suggested that death occurred elsewhere, somewhere between 1 and 5 days prior to the trunk being found. The trunk was full of blood indicating that a hemorrhage had not occurred. This also indicated that the throat could not have been cut. There was no evidence of recent sexual activity or an attack on the genital area. The cut towards the vagina gave the appearance that the knife had slipped. The cuts on the body appeared to have been caused by a left-handed individual. The cuts were sharp and were skillfully done, but did not necessarily indicate anatomical knowledge. The cause of death was determined as syncope, as shown by the condition of the heart and the general bloodlessness of the tissues, indicating massive hemorrhage (Evans & Skinner, 2000).

Details of the Frances Coles case

The body of a woman was found on Friday, 13 February 1891 lying in the roadway in Swallow Gardens, Royal Mint Street, Whitechapel. The body was discovered at approximately 2:15 a.m. by a police constable. The victim was still alive when discovered, with blood issuing from her throat, but died shortly after the constable found her. The victim was later identified as Frances Coles. Coles was approximately 26 years old, approximately 5 feet tall, with brown hair and brown eyes. No other identifying information was available.

Two cuts were found in her throat sufficient to account for death. The body was not mutilated in any other way. The area was carefully searched and two shillings (wrapped in two pieces of old newspaper) were found in a space between a water pipe and some brickwork about 18 yards from where the body was found. No other evidence was found at the scene of the murder (Evans & Gainey, 1998; Gordon, 2001; Sugden, 2002; Evans & Skinner, 2000).

CRIME SCENE CHARACTERISTICS AND ASSESSMENT

For the purposes of this study, crime scene characteristics will be reviewed to identify *Modus Operandi* (MO) and *signature* characteristics. MO characteristics refer to the offender's actions during the commission of a crime that are necessary to complete the crime. Experience and confidence will shape and modify an offender's MO. Signature characteristics, or a killer's calling card, are those actions that are unique to the offender and go beyond what is necessary to kill the victim. While MO can change over time and reflect the nature of the *crime*, signature characteristics remain stable and reflect the nature of *offender*. Although an offender's signature may evolve, the core features of the signature will remain constant (Douglas & Munn, 1992a; 1992b; Douglas & Olshaker, 1997; Geberth, 1996; 2003; Keppel & Birnes, 1997; Keppel, 1995a; 1995b; Keppel, 2000; 2004).

Signature analysis is a widely used crime scene assessment practice in the United States, and is the only crime scene assessment technique that is accepted in court testimony and appellate decisions (*State of California v Cleophus Prince*, 1992; *State of Delaware v Steven B. Pennell*, 1989; *State of Louisiana v Nathaniel Code*, 1994; *State of Washington v George Russell*, 1994; Keppel & Weis, 1993a). What follows is a discussion that summarizes the MO and signature characteristics of the Whitechapel murders. The main question addressed, based on the apparent MO and, particularly, signature characteristics, is which of the Whitechapel murders are linked and attributable to the same killer?*

It is important to note the distinction between the killer's MO and signature. The killer's MO in six of the Whitechapel cases evolved as he gained experience and learned what he liked and didn't like. For example, in the Mary Kelly case, she was killed indoors, at her residence, while the other murders occurred outside. This represented a change in the killer's MO, to decrease the chance for interruption and allow for more time with the victim after death. However, the killer's signature characteristics did *not* change, and the evidence demonstrates that the same person murdered Tabram, Nichols, Chapman, Stride, Eddowes and Kelly. The murders of Smith, Mylett, McKenzie, the unidentified victim, and Coles could not be linked through signature analysis to other cases.

Modus Operandi characteristics

In the six linked cases, the killer's MO included attacks on white, female prostitutes, typically between 24 and 45 years old. He preyed on women who were poor. The evidence shows that when the women hiked their skirts in preparation for sex, the killer grabbed their throats and strangled them. The victims were then lowered to the ground with their heads typically pointing to the killer's left. This is supported by the lack of bruising on their heads as noted in the coroners' reports.

*There are a number of contemporary methods of linking cases, most of which were unavailable and/or inapplicable at the time of the *Ripper* murders. Most of them depend on having evidence on a viable suspect—for examples, DNA, fingerprints, trace evidence, and so on—who may be linked to shared victims based on that information. Without that kind of evidence or a viable suspect, as in the Whitechapel murders, the connection among victims must be based on more rudimentary information, gleaned from the crime scenes, witnesses, and coroners. Geographical profiling may be useful in describing the ecology of victimization, but it will not connect the individual victims. As one would expect, the locations of the Whitechapel victims are confined to a relatively small area, one that would be accessible by someone who was most likely, at that time in that neighborhood in London, to be on foot, and who would not be transporting bodies any distance. Even among contemporary serial killers, they contact, kill, and dispose of victims within a relatively small circumscribed area, even with their ability to separate contact, murder, and disposal sites by transporting victims in automobiles (Keppel & Weis, 1994).

The killer preferred to commit his crime in the darkest hours, attacking his victims between midnight and 6:00 a.m. The murders usually occurred in the latter part of the week. The six murders occurred in a three-month period, between 7 August 1888 and 9 November 1888. The murders were located within a one-mile square area. Each successive murder from Smith to Kelly was less than a mile from the previous murder site, with the murders of Stride and Eddowes less than half a mile apart. The victims were not transported to another location after death, but were left where they were killed.

The weapon used in the murders was a sharpened long knife. The victims were already dead or unconscious from manual strangulation before their throats were cut. The women's throats were cut from the left side while they were on the ground rather than standing. This is evidenced by the lack of blood on their clothing and is supported by the coroner's reports.

In the first murder victim linked to *Jack the Ripper*, Martha Tabram, the killer attacked her from the front. Because of the stabbing frenzy, this assault would have left the killer literally soaked in the victim's blood, increasing the likelihood of being discovered. He learned quickly and adapted his MO to attack the victims from behind and slash their throat, as in the Nichols, Chapman, Stride, Eddowes, and Kelly cases, so as to incapacitate the victim, diminish the amount of blood on his apparel, and/or decrease the chances of discovery.

Victims Tabram, Nichols, Chapman, Stride, and Eddowes were all attacked outdoors. When the opportunity presented itself, however, the killer moved indoors, into Kelly's residence, to carry out a more brutal and time consuming experience in private. This is not a significant deviation from his characteristic pattern, but rather a natural progression of the killer's needs. In several of the murders, that of Stride and Eddowes in particular, the killer had been interrupted by the arrival of witnesses on the scene (Evans & Skinner, 2000). And the killer changed his MO during the murder of Mary Jane Kelly, in that the murder took place indoors and the victim was attacked from the front as she was lying in bed.

Signature characteristics

The killer's signature is organized around the sexualized violence committed against his victims. The main components of *Jack the Ripper's* signature include the control of the victim and progressive picquerism. Picquerism is deriving sexual pleasure through stabbing, cutting, or slicing another person or by observing these actions (Geberth, 1996; Keppel & Birnes, 1997; Keppel, 2004).

While some serial killers achieve sexual satisfaction through primary mechanisms (e.g. sexual assault), others resort to secondary mechanisms related to violence. It is likely that *Jack the Ripper* utilized the violence of stabbing and slashing his victims with a knife as methods for exerting his power and control over the victim. He used a knife to penetrate the victim, and satisfied himself through the eroticized power of violence, the domination of the victim, and the mutilation and bleeding of the victim, rather than sexual intercourse.

Signature analysis

Based on the analyses, the following discussion summarizes the signature of the killer in six of the 11 Whitechapel murders. It is not evident in the other five of them. More specifically, what features distinguish the signature of *Jack the Ripper*?

First, picquerism is evident in the proliferation of stabbing and cutting wounds to each victim. While not all of the victims received the same number and type of injuries, the picquerism remained constant as the killer progressed across a continuum of escalating violence. He moved from stabbing the breast and genital areas in the Tabram case, to mutilating these areas in the Nichols case, to harvesting organs in the Chapman and Kelly cases. In all cases there was no evidence of sexual intercourse or sexual activity, but the sexual component of picquerism is evident as well as other secondary deviations in the form of more and more mutilation and, eventually, evisceration and organ removal.

Second, the murders of Tabram, Nichols, Chapman, Stride, Eddowes, and Kelly demonstrated the killer's need to completely incapacitate his victims and gain their immediate submission. His attacks, from the multiple stab wounds, the near severing of the head from the body by slashing the throat, the number of localized areas of brutalization, and the excessive mutilation all indicated the killer's need to immediately incapacitate, subdue, and silence all six victims before committing additional degrading brutality against their bodies. In the Stride murder the killer was interrupted, so additional brutality did not occur.

Third, characteristic of this killer's signature was overkill, to have complete control and domination over his victims. *Jack the Ripper* administered an excessive number of fatal wounds, which went above and beyond what was necessary to kill the victims.

Fourth, the victims were left in the open and on display in an effort to further degrade them and shock those who discovered the bodies. No efforts were made to hide or dispose of the victims. The first five victims were intentionally left in outdoor locations. In the Kelly case, he left her in her own room where she would be found by anyone searching for her. In fact, this killer obviously left the victims where others would find them. The flaunting of the bodies in public places suggests that he believed himself invincible, in control, and beyond the reach of the police and public who were beneath him. He made it clear that his victims were completely vulnerable, and he discarded their bodies for anyone to find.

Fifth, the characteristic of posing was evident in the *Jack the Ripper* murders. In all of the cases, except when the killer was interrupted in the Stride case, he left the bodies posed flat on their backs. Stride was dropped on her side initially, and then left lying flat on her back with her wounds exposed. He often left the victims' legs splayed and their genitalia exposed in a sexually degrading manner, such as in the Tabram, Chapman, Eddowes, and Kelly murders. Each murder had some element of posing, from the arrangement of clothes, the placement of a thimble, the splaying of legs, to the arrangement of organs, intestines, and tissues. In each case a pattern of successive efforts to pose the body was obvious. These efforts to pose the body became more blatant as the series progressed. In summary, the posing indicated that the killer intentionally left his victims in sexually degrading positions to emphasize that he considered them disposable.

Sixth, as *Jack the Ripper* spent more time undetected with his victims, his violence escalated to include post mortem mutilation and the harvesting of organs. While the need to inflict excessive injury and blood loss occurred early in his series, the Ripper's technique broadened to mutilation, the removal of organs, and amputation of body parts. Throughout the series, the killer targeted specific areas of attack for mutilation, focusing on the breasts, genitalia, abdomen, and neck. As evidenced in the Kelly murder, the killer amputated the victim's breasts and attempted to amputate the legs at the thigh and knee. Similar mutilations and efforts to amputate were visible in the Eddowes case. In fact, efforts to mutilate can be traced back to the Nichols and Tabram cases, as well as forward to the Kelly murder.

The removal of organs and their placement at the scene was also part of the evolution of the killer's signature. The killer cut and mutilated most bodies after death. This evolved into removing organs and placing viscera outside the body at the scene of the murder. The mutilation was another element in destroying the humanity of his victim and attempting to shock and horrify those who found the bodies. With the exception of the interrupted murder of Elizabeth Stride, all of these cases contained characteristics of excessive pre- and/or post-mortem mutilation.

Seventh, the attacks were planned. The killer brought his weapon to the crime scene, and he took it with him when he left. It is unlikely that he needed to use the weapon to instill a sense of fear and force compliance from the victim since they were incapacitated quickly through stabbing and cutting. The body recovery site in the *Jack the Ripper* cases was the same as the murder site and initial assault site. No evidence was left at the scene by the killer, which also shows pre-planning and organization.

The absence of a struggle with the victims shows pre-planning and experience on the part of the killer. His planning was also evidenced in his choice of public murder sites that allowed him to conduct his crimes largely undetected and to slip away unnoticed in high traffic areas. In the Chapman and Eddowes cases, the killer was taking more time to mutilate and harvest the organs of his victims. The extreme mutilation to Kelly's body required continuous and uninterrupted time. The increasing amount of time spent and the privacy required in committing these murders would necessitate preplanning and prior knowledge and/or familiarity with the murder locations (Canter, 2003).

In the cases of the five other Whitechapel murder victims, they could not be linked to *Jack the Ripper* through signature analysis. The killer(s) of Smith, Mylett, Coles, McKenzie, and the unidentified victim did not engage in the same pattern of escalating signature behaviors exhibited by *Jack the Ripper*, including the careful planning of the murders, picquerism, and the posing and mutilation of victims.

HITS analysis

Since the signature characteristics of a killer are known to be rare among murderers in general (Geberth, 1996; 2003; Keppel & Birnes, 1997; Keppel, 1995a; 1995b; Keppel, 2000; 2004), an analysis of all 3359 cases from the Homicide Investigation Tracking System (HITS) that occurred between 1981 and 1995 was conducted to determine the frequency in contemporary murders of the main characteristics observed in the *Jack the Ripper* murders. HITS is a computerized repository of all homicide cases for Washington State (Keppel & Weis, 1993a; 1993b) which have occurred since 1981. The purposes of this analysis were to determine the frequency of:

- (1) The individual MO and signature characteristics displayed in the six Whitechapel murders attributed to *Jack the Ripper*; and
- (2) The combination of MO and signature characteristics displayed in those murders.

While it is not possible to determine the rarity of the characteristics in murders from 1880s London based on a database from the United States, the rarity of these characteristics occurring together in a murder series is apparent in the HITS data (Table 2).

The most significant findings are revealed when analyzing the combinations of victim and crime scene characteristics evident in the Whitechapel cases (Table 3). There were only nine cases in the database in which the victim's body was probed, explored, or mutilated, six of them females, only one being a prostitute. There are only two cases, both

Table 2. Frequency of MO and signature characteristics in the Whitechapel murders

Total murders	3359	100%
Female victims	1120	33%
Stabbing or cutting weapon used	708	21.1%
Stab wounds	597	17.8%
Body openly displayed	258	7.7%
Trophies taken	222	6.6%
Prostitutes	114	3.4%
Cutting or incising wounds	91	2.7%
Unusual body position (staging or posing present)	57	1.7%
Trauma to neck	60	1.6%
Trauma to abdomen	52	1.5%
Explored mutilated cavities	9	0.3%
Trauma to genitalia	2	10.1%

Table 3. Frequency of combination of MO and signature characteristics in the Whitechapel murders

All murder cases	3359	100%
Prostitute + unusual body position	10	0.27%
All cases involving probed, explored, or mutilated cavities	9	0.26%
Female + mutilation	6	0.17%
Unusual body position + mutilation of body	2	0.05%
Prostitute + mutilation	1	0.03%
Prostitute + unusual body position + mutilation of body	0	0%

females and neither a prostitute, that contain both characteristics of unusual body position and explored, probed, or mutilated body cavities. More significant, there are no cases where the body of a prostitute displayed both characteristics of unusual body position and explored, probed, or mutilated cavities.

The initial analyses demonstrated that many of the individual characteristics and the combination of the signature characteristics observed in the *Jack the Ripper* murders were rare. In fact, murderers who stab and kill female prostitutes, leave their bodies in unusual positions, and probe, explore, or mutilate body cavities are extremely rare. It would be extremely unusual to find more than one of these killers, exhibiting that combination of signature characteristics, operating in the same area at the same time.

DISCUSSION

As shown by the HITS analysis, the signature characteristics observed in the murders of Tabram, Nichols, Chapman, Stride, Eddowes, and Kelly are extremely rare. At the center of *Jack the Ripper's* signature was the display of control over the victim through the use of a knife to penetrate the victims' bodies and desecrate their sexual regions. Five of the six victims were stabbed repeatedly in the genital area. Stabbing and cutting wounds are relatively common in murders, but trauma to the genital area is extremely rare—in less than one tenth of one per cent of all murder cases in the HITS system.

The use of posing and mutilation were also examples of his control over the victims, leaving them on display in sexually degrading positions with the wounds exposed. The scenario revealed in the *Jack the Ripper* murders was so rare that the HITS analysis uncovered *no* cases in which the murder of a prostitute displayed both characteristics of posing and mutilation. In fact, the combination of characteristics of posing and mutilation occurred in only 0.05% of all murder cases.

The victims' bodies and crime scenes revealed this killer's progression across the violence continuum. *Jack the Ripper* progressed from multiple stabbings in the Tabram case, to mutilation in the Nichols case, and the harvesting of organs in the Chapman, Eddowes, and Kelly cases. Each case showed successive violence to the body and increased mutilation, with the exception of the murder of Elizabeth Stride. During the Stride murder the killer was interrupted, which required the killer to finish the job he had started on his next victim, Catherine Eddowes, less than two hours later (Sugden, 2002; Evans & Skinner, 2000; Begg, 2003).

The sexual and control components of these murders, and the element of picquerism, are characteristic of *Jack the Ripper's* signature. At the core of this killer's signature is the expression of sexual violence perpetrated by the stabbing and slashing of his victims. Each victim in this series displays the characteristic of picquerism and the killer's need to dominate the victims. The killer incapacitated each victim, gaining her submission, exerting complete control over her body, while engaging in actions that amounted to overkill. He then left the victims' bodies open and on display for anyone to find. As time elapsed, his crimes progressed, became more violent, elements of posing became more obvious, and the mutilations more severe.

The pattern and the signature, however, remained constant. As his needs and desires became stronger, including the need to avoid detection and to sate his sexual appetite, his crimes became more violent and his MO adapted accordingly. While there was no evidence of the primary mechanisms of sexual activity, there was an overriding sexual nature as evidenced in the signature characteristic of picquerism. Martha Tabram, Mary Ann Nichols, Annie Chapman, Elizabeth Stride, Catherine Eddowes, and Mary Jane Kelly were all victims of the same killer and showed characteristics unique to this killer's signature, as well as to his MO.

SUMMARY

Typically, in sexually-oriented murders the killer's approach to the victims is predatory. The selection of prostitutes and the location of the murders ensured that *Jack the Ripper* would succeed in carrying out his fantasies. His MO contained the actions necessary to commit the murders. *Jack the Ripper* killed within a one-mile square in the Whitechapel area between midnight and 6:00 a.m. His victims were all white, female prostitutes between the ages of 24 and 45 years old. He used a knife to stab and cut his victims. His initial murders were committed outdoors, but he moved indoors with his last known victim. The MO of *Jack the Ripper* changed from one murder to the next as the killer learned more effective techniques.

The activities above and beyond what were necessary to murder the victims, were the killer's unique signature. *Jack the Ripper's* signature was clear in six of the Whitechapel murder cases and exhibited the following characteristics: 1) the injuries sustained by the victims displayed the signature characteristic of picquerism; 2) the killer displayed a level

of overkill in each case that escalated over the series; 3) the victims were incapacitated immediately and killed quickly to enable the killer to live out his fantasies; 4) the killer exhibited complete domination over each victim; 5) the victims' bodies were left open and on display; 6) the victims in this series were displayed in unusual body positions, revealing signs of posing; 7) the victims were left in sexually degrading positions with their legs spread and genitalia exposed to illustrate their vulnerability after death and the killer's dominance; 8) the killer mutilated his victims and showed increased postmortem mutilation from one victim to the next; 9) the killer evolved to the removal of their organs and body parts, and removed some of them from the crime scenes; 10) the killer targeted specific areas of attack, stabbing and slashing the breasts, genitalia, abdomen, and sexual organs of the victims; 11) the murders were planned and organized; and 12) the combination of these actions created a unique signature with which we can link the six victims of one killer, *Jack the Ripper*.

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