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Binding femininity: an examination of the effects on tightlacing on the female pelvis

Katherine Marie Klingerman
Louisiana State University and Agricultural and Mechanical College, kkling3@lsu.edu

BINDING FEMININITY: AN EXAMINATION OF THE EFFECTS OF TIGHTLACING ON THE FEMALE PELVIS

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Abstract

The corset in eighteenth and nineteenth century Europe was not merely an article of clothing. The corset was a complex and often contradictory social and cultural symbol. It symbolized both the sensual female body and the chaste virgin; the female control over male desires, and the male's control over the female body. The ubiquity of the corset in the eighteenth and nineteenth century Europe is an important commentary on historical European society. Reports of women (and men) who have died as a result of the tightness of their corsets abound in the literature. Case studies from medical professionals provide information on the changes corsets wrought in the soft tissues of the women who wore them. However, to date, no systematic studies have been conducted which detail the changes in the bony pelvis.

This study examines the effect of corseting upon the female and male pelvis of the Spitalfields skeletal collection, with consideration of consequential reduced fecundity and difficulties in parturition. Corseting status was determined through the presence or absence of compression on the ribs. Results show arcurate line length was significantly shorter in females with deformed ribs than in females with normal ribs, and the females with deformed ribs were significantly younger than the normal rib females. In addition, transverse diameter of the inlet and maximum femoral length approached significance, with females having deformed ribs being smaller. There was no significant relationship between pelvic contraction and deformed ribs, and deformed rib females retained a significantly larger pelvis than normal rib males. These data indicate that corseting did

change the average size of the female pelvis, but not sufficiently to change the obstetrical sufficiency of the corseted pelvis.

Introduction

> "As soon as men were sufficiently elevated above the beast to admire the forms of women, women began to shape themselves to an ideal" (Bouvier 1852:355)

The corset in eighteenth and nineteenth century Europe was not merely an article of clothing. The corset was a complex and often contradictory social and cultural symbol. The corset represented both the sensual female body, and the chaste virgin; the female control over male desires, and the male's control over the female body (Kunzle 2004). By the turn of the nineteenth century, the corset was a mandatory garment for all pubescent and post-pubescent females. The ubiquity of the corset in European history is an important commentary on historical European society.

The unique role of the corset in society has assured its central location in countless texts and articles. Any social history of the nineteenth century, no matter its focus, must mention the corset within its pages, or excise a large and fundamental aspect of the time period from its interpretations. Most discussions of the corset revolve around the heated medical debate regarding the dangers and benefits of corsetry. On the one hand, medical professionals from the fifteenth century onward damn the corset for warping the bodies of young women (and men), and for "lay[ing] siege to the child-bearing citadel itself" (Stockham 1889:109).

Throughout history, corsets have been blamed as the cause of uterine and breast cancer, tuberculosis, fainting, anemia, and even death. Reports of women (and men) who have died as a result of the tightness of their corsets abound in the literature. While a

good many of these cannot be verified, and as such must be taken with a grain of salt, other testimonies have been verified at the autopsy table of noted physicians.

On the other side of the argument, nearly as many medical professionals have held that the corset was necessary for the proper development of the developing body, and for the developing female body in particular. Many physicians felt that if children were not adequately bound throughout childhood, their bodies would develop crooked. Scoliosis was often cited as the result of inadequate binding and support during childhood (see sources in Steele 2001).

Attempting to balance on the cusp of these two sides were medical professionals and dress reformers who sought to improve the design of the corset. The main goal of these individuals was to provide the required support and figure molding of traditional corsets, while avoiding the side effects frequently associated with their use. To this end, devices such as electric corsets, which incorporated magnets into their design to provide "a most beneficial influence upon respiratory and other organs" (Werner 1998:93) were invented and sold on the open market. Corsets such as this nearly always incorporated testimony from doctors touting the health benefits of the corset in question.

Through all this debate, few systematic studies have been done that quantify the deformation of the female body due to corseting. Most of the scientific knowledge available regarding corsets and their physiological effects comes from case reports, usually only one or two, from various physicians who have come across a corset-related death in their practice (i.e., Bouvier 1852, Paré 1634, Soemmerring 1893). Dr. Robert Dickinson (1887) did conduct a study on the pressure exerted on the torso by corsets, but this was a rarity. Most of the information about the dangers of corseting came from

testimony from the laity and the medical community. This unfortunate fact has greatly clouded the study of corseting and health today, as the modern researcher must wade through the erroneous data in order to make the correct interpretations.

Research Goals

This study examines the effect of corseting upon the female pelvis. The deformations of the pelvis that resulted from this practice will be evaluated with regard to subsequent consequences for fetal survival and successful parturition. The constriction of a developing pelvis may have significant obstetrical consequences. Continuous tightlacing may reduce the size of the false (major) pelvis, as well as the pelvic inlet. The false pelvis is defined as the space bounded posteriorly by the lower lumbar vertebrae, laterally by the iliac fossae, anteriorly by the abdominal muscles, and inferiorly by the arcurate line (Pritchard et al. 1985). The false pelvis houses a large portion of the lower abdominal viscera. The pelvic inlet is the first portion of the birth canal that the fetus must pass through. If this reduction in pelvic size were severe enough, the ability of that female to bear children would be negatively affected.

The goal of this research is to quantify the deformation of the pelvis due to corseting, and evaluate said deformation's impact on the likelihood of successful parturition. Deformation of either the false pelvis or the pelvic inlet could affect fetal growth and parturition. The false pelvis would likely be the most intensely affected by corseting. Long-term tightlacing is expected to narrow the false pelvis, the pressure of the corset deforming the ilia medially. The reduction in size of the false pelvis has obvious obstetric consequences, as the pelvis must be wide enough to accommodate both the

developing fetus and the woman's viscera. Therefore, constriction of the false pelvis may hinder the development and growth of the fetus.

The pelvic inlet is a major determination of obstetrical adequacy of the maternal pelvis. Therefore, reduction in inlet size can have serious consequences for both mother and infant. Haller and Haller's (1974:168-9) research indicates that nineteenth century physicians were concerned with the narrowing of the pelvis in corseted females. This narrowing may be in reference to the inter-iliac breadth (i.e., the false pelvis), but may have affected the pelvic inlet as well. If this is the case, then the transverse diameter of the pelvic inlet should be reduced without a comparable reduction in the anteroposterior (AP) diameter.

I will test the hypothesis that there is a statistically significant reduction in inlet and false pelvis size associated with corseting. Females who display evidence of compression are expected to have significantly narrower pelves relative to females without deformation. If this hypothesis is supported, then the question of whether or not the deformed female pelves are obstetrically adequate will be explored.

The remainder of this thesis is divided into two main parts. The first part reviews the various literature, both scientific and popular, regarding corsets. Due to the vast array of available literature, this review is divided into several chapters, each concentrating on a different theme relevant to this study. The second section is a report and analysis of the data collected on the Spitalfields skeletal collection. These data provide quantitative data to supplement and expand the qualitative literary data.

Part I:

Various Histories of the Corset

Chapter One: 'The Terrible Engine': The Physical and Social History of Corsets

The role of the corset in historical society is complex. Few garments in history have ever succeeded in encompassing, representing, and defining so many values of a society. Before the turn of the nineteenth century, both men and women used corseting to achieve a fashionable body profile. The tightly laced corset was closely associated with a tightly controlled body and mind (Kunzle 2004, Summers 2001).

The corset's beginnings can be traced back as far as the pre-Christian era. Kunzle (2004) uses the example of the Minoan belt, which was worn tightly around the waist, leaving the dimensions of the chest and hips intact. Males and females, goddesses and athletes are portrayed wearing such a belt on numerous Minoan figurines (Crawford and Guernsey 1951). Cylinder seals in Greek vessels indicate that waist binding diffused from the Minoan to the Greek culture, but there is little evidence to indicate that the Greeks ever molded the waist as extremely as seen in the Minoan figurines (Kunzle 2004).

In Europe in the fourteenth and fifteenth centuries, clothing for both sexes gradually changed from the looser, more relaxed styles of earlier times and became tighter, more form-fitting, and compressive. For women, perhaps the most significant change was in the emphasis of décolletage. The enhancement of the breasts was accomplished through both low necklines and the compression of the body below the bust, which forced the breasts higher. Both clergy and lawmakers saw this fashion trend as so distasteful that some villages adopted a dress code prohibiting such suggestive attire (Kunzle 2004).

The sixteenth century saw the beginnings of true body-molding clothing. The royal court of France, most particularly Catherine de Medici, the wife of Henry II, had popularized the thirteen-inch waist, which naturally became mandatory for any fashionable woman of the day. The thirteen-inch waist spread quickly in popularity to the court of Elizabeth I in England, and then onto the other royal courts of Europe (Crawford and Guernsey 1951, Steele 2001). In the words of Crawford and Guernsey (1951:7), "the corset became a kind of mold into which the woman was poured and which held her to the strictest formality." These new corsets inspired much response from the writers of that century. One French poet, Olivier de la Marche (see Leoty 1893), authored a poem titled "Le Corset ou la Cotte de Chasteté" (The Corset, or the Coat of Chastity).

In order to achieve the fashionable body of the sixteenth century, the heavily starched fabrics and metal wires in the best corsets of the previous century were rejected in favor of corsets based on a frame made entirely of steel or iron. Many women's corsets of this century more closely resemble armor than any typical feminine garment (Crawford and Guernsey 1951, Leoty 1893, Steele 2001). These rigid frames forced female (and male) torsos into a cylindrical shape, compressing the waist and de-emphasizing the breasts in order to achieve a smooth and aesthetically pleasing line (Steele 2001).

The cylindrical body ideal persisted throughout the seventeenth century and into the eighteenth. The seventeenth century also saw the specialization of corset making by tailors (Steele 2001). This specialization speaks volumes about the popularity of the corset; demand for the garment was high enough to allow concentration on its production to be profitable. In addition, whalebone, rather than strips of metal, became the standard

supporting material in corsets. The use of bone made the corset sturdier, and allowed for tighter compression of the torso (Crawford and Guernsey 1951).

The seventeenth century was also the period when the busk became an important feature of the corset. A busk is a long, thin rod, made of whalebone, metal, or horn that fits into a pocket that runs the length of the front of the corset. The busk's purpose was to increase the rigidity of the corset and help to keep the abdomen tightly compressed. Far from being generic and purely functional accessories, busks were often prettily carved. Some, given to women by suitors, were even inscribed with romantic sentiments. Others were fashioned in a more practical vein, and contained disguised daggers (Crawford and Guernsey 1951).

In the eighteenth century, the French rococo style of dress favored delicate form and excessive elegance. Panniers, frames worn under the skirt to widen the hips, also came into popularity at this time. This combination of styles meant that the waist was heavily compressed, juxtaposed with the uncompressed and artificially broadened hips. Stays of whalebone became even more popular in the eighteenth century, though the busk was still an important part of feminine court dress. Crawford and Guernsey (1951) estimate that the stiffening agents of the corset weighed at least a pound. The increasingly rigid design and advancements in construction allowed for tighter compression than in earlier centuries.

At the turn of the nineteenth century, fashion enjoyed a brief respite from the tightly compressed look. A faux-Grecian appearance came into vogue, with loosely draping clothing and a minimal bodice, called a "zona" (Crawford and Guernsey 1951). However, the rigidly compressed torso became fashionable once again with the

restoration of the French monarchy in 1814 (Steele 2001). The cylindrical torso was no longer in vogue, but the hourglass figure had at last achieved center stage in the fashion world. During this period the extremes of waist compression were noted. This compression was aided by the invention of metal eyelets, which allowed the corset to be laced tighter than ever before without danger of damage to the garment (Summers 2001).

Tightlacing reached its peak during the latter half of the nineteenth century. During the nineteenth century, the corset ceased to be worn as an outer garment. Though the more expensive varieties were still edged with lace and ribbon, the corset had become an undergarment. In addition, the corset became less and less an article of masculine clothing, and became a mandatory part of feminine garb. For a woman in the 1800s, the thought of venturing outside without a corset was simply unthinkable. According to Kunzle (2004:298):

> 52,432 corsets were sold in the year 1886. The average waist measurement was 23 inches, which gave a compression total (taking the number of corset wearers in England at 3,543,000, and their natural waist measurement at 27-28 inches) of 134 miles. The annual mortality rate resulting from this compression stood, according to a 'competent authority,' at 15,000.

Also in the nineteenth century, the physical form of the corset changed. In previous centuries, corsets and bodices had ended at the navel. This style compressed the torso while allowing the hips a measure of freedom. In the nineteenth century, corsets began binding the hips as well as the torso. This fact is significant, as it allows the corset a chance to affect the bony pelvis as well as the ribs and viscera.

In the nineteenth century, the corset became the icon of femininity and delicacy that occupies the modern cultural memory of the garment. In this era the corset largely ceased to be worn by males and came into the sole domain of the female. The gendering of the corset gave rise to new perceptions both of the garment and of the female bodies the corset encased (Summers 2001). The ubiquity of the corset in nineteenth century Western Europe and the United States made its influence nigh inescapable. The corset in this era not only affected fashions and fabric cuts, but gynecology, women's education, and feminist discourse. The nineteenth century, more than any other, was the era of the corset.

Corsets were also used to help promote correct, straight growth in children. A sixteenth century volume (Roeslin (1536), quoted in Steele 2001:12) declared that children, when "well and properly bound in their little bonds and swaddling clothes, will grow up with straight body and limbs. On the other hand, if they are bound sideways and crookedly, they will remain the same way as they grow." Though both boys and girls were placed in binding clothing to aid in proper development, female children were by and large the focus of such support. Male children were removed from their stays around the age of six, but mothers continued to lace female children into increasingly stiff and binding bodices as they aged (Steele 2001).

In some cases, early figure training was taken to incredible extremes. One student attending a fashionable London private school from age 15 until age 17 recalled the school's policy on waist training (Waugh 1990). The headmistress determined that her students should reduce their waists by one inch every month until it was determined that they were sufficiently dainty. In her memoir, the woman praises the headmistress for

training her waist from its previous circumference of 23 inches to the fashionable 13 inches achieved by the time she left the institution. One stoutly built student required the help of two maids to lace her stays to the required size (seventeen inches). The student fainted twice while being laced up, but afterwards reportedly suffered no ill health due to her corset (Lord 1893, Waugh 1990).

Another school's mistress sealed her students' stays so they could not be removed. The girls of this school were forced to wear their corsets continuously except for an hour each Saturday for the purpose of bathing and cleaning the corset (Davies 2004). While some authors (e.g., Kunzle 2004) hold that such occurrences have been much exaggerated in the historical record, the majority of scholarly works on the subject regard such extreme figure training of young girls to be a serious reflection of the importance of corseting and the fashionable waist in eighteenth and nineteenth century society.

The prevalence of tightlacing in historical England is borne out by data included in Kunzle's (2004) book, *Fashion and Fetishism*. Data pulled from primary sources that include doctors' notes, corsetieres, and advertisements indicate that while average corseted waist measurements varied between 20 and 23 inches, waist sizes of 18 to 16 inches were not considered exceptional. In 1888, one survey of twenty highly fashionable corsetieres found that 203 corsets 15 inches or less had been sold that year. Sales of corsets measuring 18 inches or less made up 42.8% (n=1,041) of the total corsets sold that year (n=2,434). Even more telling, was an estimated 30% of those corsets under 18 inches were intended for girls under the age of 16 (Kunzle 2004).

For both women and young girls, the corset has long been linked with both chastity and sexuality (Kunzle 2004, Summers 2001). These contradictory and mutually exclusive associations are part of what makes the corset such a fascinating subject of study. The corset "lever[ed] the breasts to an appropriate angle and direct[ed] the gaze to the accentuated waist and hips [while it] exacted on the female body a severe toll" (Summers 2001:2). The emphasis of the hips, buttocks, and breasts of corseted women is a radical divergence from a culture so sexually repressed that it required piano legs to be covered to maintain a necessary level of modesty (Degler 1974).

Historian Leigh Summers (2001) and others (e.g., Davies 1982) have suggested that the sexualization of the female body through the corset was rendered acceptable by the restrictions the same garment placed upon the female body. A corseted woman would be unable to perform any sort of physical activity; indeed, she would not even be able to walk more than a few hundred feet or up a flight of stairs without rest (Summers 2001). There is also evidence from medical papers that indicate that side effects of compression could include (among other maladies discussed below) a general malaise, and a repressed sex drive (Davies 1982, Summers 2001). Dr. F.A. Godman (1788, as quoted in Haller and Haller 1974:167) remarked that tightlacing "rendered the conjugal condition one of unceasing disappointment and gloomy solitude."

In this way, the corset simultaneously transformed the female body into an intensely sexual object, while reducing both the woman's ability and desire to engage in sexual activity. Indeed, in the nineteenth century, the corset was widely used as a chastity belt as well as its traditional role as a body-molding device. The corset as a device of

virtue also served to discourage the male from attempting untoward sexual behavior. In the words of one eighteenth century author:

> they now wear a steel busk down their middle, and
> a rail of the same metal across their breasts. If a hero
> attempts to storm such strong lines, and comes to a close
> engagement, he must lie as ill at ease as St. Lawrence on
> his gridiron (Walpole (1777) in Cunnington and Cunnington 1951:88).

The repression of the female sex drive was paramount for the perpetuation of a moral society in Victorian England. The minds of women were considered especially susceptible to immorality, and less able to resist temptation. Strict societal rules were put into place to minimize women's contact with anything that might harm their frail psyches (Haslam 1810). Overindulgence in any one thing was considered detrimental to mental health. Excesses of study or idleness, anger, joy, hatred, or love were all believed to be causes of insanity in women (Burrows 1828). The corset's purpose was to prevent overexertion of the female body, and in turn, the female mind.

Even if the female mind (often in conjunction with the female body) failed to keep within normal bounds, the corset was inescapable. Elaine Showalter's (1985) research on insanity in nineteenth century England reveals that even women incarcerated in asylums during this time period were required to wear corsets. In fact, personal hygiene and attention to makeup and appearance were considered to be positive diversions for the insane women. Inmates in nineteenth century mental institutions were encouraged to dedicate a large amount of time to their dress and appearance, in order to appear "normal." At the time, the appearance of respectability (that is, beautiful and well groomed and dressed) was believed to be the first and most important step to regaining sanity.

Chapter Two: 'Ill Health and Nervous Debility': Corsets and Medicine

As mentioned above, the perception of the corset in historical England was complex, dynamic, and often contradictory. Even in specific spheres, such as medicine, opinions of the corset varied. Over the centuries, many physicians saw tightlacing as detrimental, yet many of those same physicians advocated corseting for the support it provided for the "weaker" female respiratory system. Additionally, the conception that the support corsets lent to the female frame was a necessary component for proper growth and development was common. As a result, many doctors recommended that growing girls be fitted with corsets to correct posture and "wild tendencies." Despite this advocacy for corseting, many physicians appear to have been aware that corsets had a detrimental effect upon female health. Davies (1982) attributes the reluctance on the part of medical professionals to denounce the corset as representative of the corset's importance as a symbol of virtue in historical England.

Yet, in the nineteenth century, numerous scholarly papers, articles, and books were published which warned of the dangers of tightlacing. Several of these articles credited corsets as the cause of ailments ranging from prolapsed uterus (Dickinson 1887), to uterine cancer, to tuberculosis (Soemmerring 1893).

However, making a study of women's illnesses in the eighteenth and nineteenth centuries and determining which ailments may be due to corseting is difficult. The primary cause of this difficulty is the traditional view of the nineteenth century middle-class woman as the willing invalid. This view, which became popular with medical

professionals in the nineteenth century, classified most women's illnesses as "female complaints," also called "womb ills" and "nerve tire" (Frederick 1895:355). Vrettos (1995) among others theorizes that these illnesses were actually a psychosomatic response to the tedium of upper- and middle-class women's lives in the nineteenth century. Vrettos (1995:13) calls female complaints a "conduit in which relations between the individual and the social body were negotiated."

The alleged psychosomatic nature of female complaints in the nineteenth century has led many social historians to disregard all illnesses and ailments connected with the female body as purely mental in etiology. While this may certainly be true in some cases, this opinion of female complaints disregards the agency and free will of the nineteenth century woman, painting her as a passive agent, submitting herself entirely to the vagaries of a fashionable demeanor (Summers 2001). Such generalization is erroneous and causes difficulties in studying the damaging effects of corseting.

While modern medical knowledge affirms that corsets could not possibly have caused illnesses such as tuberculosis or cancer in women, the prolapsed uterus was almost certainly attributable to corseting. Nineteenth century medical literature gives good indication of the frequency of this condition. Harriet Beecher alluded to uterine prolapse when she warned that corsets were responsible for ailments "peculiar to women" (Beecher 1870:249). Beecher and Beecher Stowe (1870) also relate testimony from their colleague, Dr. (Mrs.) Gleason, who treated 130 patients suffering from uterine prolapse from 1854 to 1855. One doctor (Summers 2001:113), writing in 1888, testified that "uterine derangement had increased fifty percent within the last fifteen years as a result of tight clothing, corsets and high heels." Many doctors in the nineteenth century blamed a prolapsed uterus on corseting and the internal pressure the practice produced. However, many

physicians seem to have been reluctant to speak up openly against the corset for fear of seeming improper or immoral.

Dr. Robert Dickinson (1887:515), in his study of corseting pressure on the internal organs, stated that,

> This displacement of the pelvic floor and this abdominal pressure . . . bear largely on the moot question of the import-ance of the corset as an agent in producing uterine disease and displacement . . . there can be no question that the uterus must descend with the structures about it . . . It naturally follows that this forcing downward is sufficient to render the uterine supports tense . . . and that in their taut condition any extra or added stress . . . yielding must in time occur.

By far the most common "cure" for a displaced or prolapsed uterus was the pessary. A pessary is a device that is inserted into the vagina and serves to support the uterus and force it back into place. The pessary became so common that corset designs began to incorporate the device into the garment. Elizabeth Rowland developed one such corset in 1897 (Patent no. 9955). Far from being the "hygienic" corset Rowland advertised, the pessary corset was so heavily boned and reinforced (including a metal busk and detachable belt to help compress the lower abdomen) that it seemed designed to cause the very displacement the corset claimed to cure (Summers 2001).

Several researchers, both historical and modern (i.e. Beecher and Beecher Stowe 1870, Summers 2001), have suggested that the pessary was over-prescribed for uterine displacement and prolapse in the nineteenth century. While these authors maintain that prolapse and displacement were indeed serious and common results of tightlacing, they hold that in many cases such mechanical intervention was unnecessary. Both Beecher and Beecher Stowe and Summers contend that had women simply removed their corsets, even temporarily, the symptoms of uterine prolapse and/or displacement would lessen.

Whether or not this is true, the ample historical literature indicates that few women would have gone without their corset, even for a few days.

Studies of the effects of corseting have also been done at autopsy. Soemmerring (1893) describes cases of women arriving on his autopsy table with "waistlines no larger than the circumference of their heads." Dr. Richard Buck described "corset liver" in his 1892 doctoral thesis, where a portion of a tightly corseted man's liver protruded into his pelvis, barely connected to the main body of the organ. However, this particular "malady" may have simply been an extraneous lobe of the liver, and not pathological in the least (Schwartz 1979). Ambroise Paré, a sixteenth and seventeenth century physician, wrote of the death of a courtier that he attributed to her corset. Upon autopsy, Paré (1634:624) found the woman's eleventh and twelfth ribs "overlapping each other."

In 1887, Dr. Robert Dickinson conducted a scientific experiment to measure the amount of pressure corseting placed on the torso. Dickinson used a manometer to measure pressure upon various areas of the torso in 52 women. None of the women in this study self-identified as tightlacers, nor did any boast corseted waists smaller than twenty-one inches. Additionally, several women did not corset for the majority of the day; some did not corset everyday. However, Dickinson discovered that "the amount of constriction at the waist bears no constant proportion to the amount of pressure exerted by the corset" (Dickinson 1887:511). Rather, the strength of the abdominal walls, the rigidity and the shape of the corset determined the amount of pressure brought to bear upon the torso.

Dickinson (1887:510) noted that the manometer registered a "distinct fall of the mercury during the first twenty seconds after the primary rise that occurs when the corset

is hooked." That is, after the original sharp rise in pressure that accompanied the fastening of the corset, there was a drop in the pressure exerted on the torso. Dickinson attributes this to the evacuation of blood from the organs and air from the lungs. Dickinson also noted that the pressure temporarily increased when the corseted woman moved.

Dickinson also measured the change in chest and abdomen shape with calipers. He found that the tapering of the corseted chest began with the fifth rib, rather than with the seventh rib as with the unbound torso. As a result, the inferior border of the lungs was compressed, significantly reducing lung capacity. The compression of the lower ribs forced the upper lobes of the lungs to work harder to supply an adequate amount of oxygen (Dickinson 1887). This finding is in accord with medical texts of the day that stated that women's breathing differed significantly from the breathing of men. Doctors of the period held that females breathed thoracicly, from the upper portion of their chest, while males breathed more abdominally (Kunzle 2004, Summers 2001). This belief, inextricably linked to the corset, also helped to give rise to the beloved image of Victorian literature, the heaving bosom.

Dickinson (1887:515) described the effects of compression against the abdominal organs:

> The lateral pressure will crowd liver and spleen toward the median line. The stomach will be pinched between its more solid neighbors, though both liver and spleen mold readily under pressure.

Dickinson also provides numerous illustrations that demonstrate the extreme effects of corseting upon the torso. Though Dr. Dickinson's illustrations are illuminating, Dickinson never used dissection or autopsy to verify that these processes were actually

occurring. The “before” and “after” concepts of his illustrations are based largely on previous literature and his own theories.

Another malady that has been historically linked to corseting is chlorosis, also called “green-sickness” or “virgin’s disease,” and is perhaps one of the most widely distributed and widely accepted corset-related disease (Duffin 1978, Summers 2001). Chlorosis is an anemic condition characterized by pale skin, tiredness, fainting, and breathlessness (Vertue 1955). The term (and, presumably, the condition) went out of common usage in the 1930s. The decline in the use of the term ‘chlorosis’ is closely correlated with the declining popularity of the corset (Summers 2001).

The symptoms that characterize chlorosis are especially significant since they are all part of the nineteenth century concept of the correct and desirable female. Historian Elaine Showalter (1985) posits that nineteenth century men prized the pale face, weak demeanor, and slight, waif-like figure. This delicacy was considered to be a feature of the over-bred upper classes and thus signified that such a woman was a prime marital candidate. The delicate, refined woman was highly valued as a beauty, while the healthy or robust woman lacked femininity.

Showalter (1985) also states that the “fading” female was so common in nineteenth century middle-class society that the condition became normative. Weakness and delicacy no longer necessarily denoted a morbid condition, merely the appearance of one. Such values were also seen regarding the disease tuberculosis. Women suffering from the disease became pale, red-lipped, and weak. The course of the disease also allowed women to fade away in an appropriately feminine manner. For these reasons, tuberculosis was considered a “good” or “beautiful” death, which in turn resulted in the

romanticizing of the condition and its subsequent presence and importance in contemporaneous literature (Jalland 1996, Morley 1971). The symptoms of chlorosis mimic the symptoms of tuberculosis, lending the prestige of the dying flower to the corseted woman. For the most part, corsets allowed women to display the highly desireable signs of the tubercular victim without actually dying (Showalter 1985, Summers 2001).

The corset was not without its supporters. Doctors in the nineteenth century were known to promote corsets in advertisements, claiming that "their" brand of corset was healthier or more hygienic than competing brands. For example, Dr. Gambier touted the benefits of the "Invigorator Corset," claiming that the garment "gives support without impeding the perfect freedom in the movements of the body" (Summers 2001:90). During the 1880s, Dr. Scott's Electric Corset enjoyed immense popularity. The advertisements for this corset claim that it was built using "scientific principles," and incorporated magnets to create a "health-giving current" (Summers 2001:91).

Kunzle (2004) largely disregards reports of illness and deaths due to tightlacing. Kunzle holds that tightlacing was largely the domain of the lower middle class, and further was not nearly as widespread as the literature assumes. Kunzle tends to regard most contemporaneous accounts of tightlacing (i.e., that of the private school in London mentioned above) as highly exaggerated if not entirely fictitious. Kunzle maintains that tightlacing was and remains within the domain of fetishism, and thus was practiced by only a small segment of the population. While Kunzle's *caveats* regarding historical literature are certainly relevant, the volume of material regarding tightlacing, both in the

public and the medical spheres, indicates that the practice was probably widespread during nineteenth century.

Dr. Gerhart Schwartz (1979) wrote a fascinating article on corseting, and specifically the widespread rejection of the corset by historical German society. Despite this focus, Schwartz still maintains a distinctly pro-corset position. While Schwartz makes many interesting observations, certain of his conclusions regarding corsets seem to be in conflict with those of other historical and modern researchers. For example, Schwartz derides Soemmerring's (1893) condemnation of the corset, stating that Soemmerring managed to attribute every disease that afflicted women to corseting, including the aforementioned tuberculosis and cancer. Schwartz also questions the conclusions Soemmerring drew about certain women who wound up on his autopsy table with "waistlines no larger than the circumference of their heads." Schwartz holds that this is an entirely natural phenomenon and does not indicate corseting.

As mentioned above, the average "natural" waistline of women in the 1880s was estimated at 27-28 inches (Kunzle 2004). Average head circumference of early twentieth-century females was estimated at about 21 inches ([53.33 cm], Blakeman et al. 1905), a measurement that falls neatly into the average corseted waist size (20-23 inches) of the 1880s (Kunzle 2004). While 21 inches may not be out of the range for a natural waist circumference, Dr. Schwartz's disregard for corseting in the etiology of such a slender waist seems hasty.

Chapter Three: 'The Siege of the Childbearing Citadel': Corsets, Fecundity, and Maternity

The most vehement protests against the corset in the eighteenth and nineteenth centuries revolved around the pregnant woman and the health of her unborn child. Dr. Alice B. Stockham (1889:109), an American anti-corset activist, proclaimed "let those who had rather bury than raise their children, marry tight lacers." The corset was never so controversial as when it existed in the sphere of the maternal body.

In the modern day, the thought of a pregnant woman donning such compressive clothing is repellant. Yet, in the nineteenth century, this was not only widely practiced, but may have been viewed by the women themselves as necessary (Summers 2001). The predominating view of pregnancy in the nineteenth century, both by the laity and the medical community, was as a pathology. Pregnant women were looked upon as though they had some debilitating (and, it was believed, possibly communicable) illness and were treated as such (Summers 2001).

Society at large considered exposure to the unsightly physical changes wrought on a woman's body by pregnancy to be undesirable and improper for men and non-pregnant women. In many ways, the pregnant woman embodied everything nineteenth century fashion despised: the formerly tiny waist now expanded with child, and the healthy glow of impending motherhood spoiling the previously perfect tubercular whiteness of skin. Therefore, shielding society at large from the expectant mother became paramount. A pregnant woman could expect a "lying-in" time (confinement to either the bedchamber or to the bed itself) that encompassed most of the latter two-thirds of her

pregnancy. As soon as the physical signs of pregnancy began to show, the woman must be quarantined from polite society (Summers 2001).

Therefore, the fact that expectant mothers compressed their expanding abdomens to the fashionable ideal for as long as possible is not surprising. This is especially true for women in the middle and upper classes, where the public social scene was often one of the few venues for interaction with peers. Once the lying-in period had begun, non-medical visitors were severely restricted, and the woman would have little to occupy her time (Davies 1982).

Naturally, the "healthful" corset manufacturers stepped up to offer a compromise. Maternity corsets were popular in the nineteenth century (Summer 2001). These corsets claimed to allow a fashionable figure without harming the developing fetus. In reality, these claims seem highly doubtful. The maternity corsets placed just as much pressure upon the abdomen, and many featured a belt specifically designed to cinch in the expanding waistline (Davies 1982, Summers 2001).

The compression of the abdomen from any type of corset, and the resulting distortion of the pelvic floor, caused numerous difficulties, not only regarding carrying the fetus to term, but of conception as well. As mentioned above, the conditions of uterine displacement and prolapse affected fecundity through both the obvious physical consequences, and through lower frequency of intercourse due to painful coitus (Davies 1982). Davies (1982:630) also (rather jokingly) makes mention of the "physical barrier represented by the corset, especially if night stays were worn." The arduous process of removing the corset would have hindered attempts at impulsive intercourse and could have had a negative impact on coital frequency.

Chlorosis (mentioned above) is especially important with regard to this thesis. In addition to the tuberculosis-like symptoms, chlorosis can also cause amenorrhea. Amenorrhea, or cessation of the menses, is a serious symptom of any condition, as it directly affects fecundity. An amenorrheaic woman would suffer from greatly reduced fecundity and would be unlikely to be able to conceive a child until the condition is rectified. Considering the prevalence of chlorosis in the nineteenth century, and the desirability of the vast majority of the symptoms resulting from chlorosis, the general fecundity of corseted women was likely reduced during this era.

Davies (1982) also credited corsets themselves as causing amenorrhea without the onset of chlorosis. Dickinson (1887) noted that more tightly corseted women tended to have less fatty tissue than non-corseted women. In addition, the compression of the stomach reduced the woman's ability and desire to eat, resulting in higher rates of malnutrition for corseted females (Davies 1982, Kunzle 2004). The critical body fat hypothesis (i.e. Frisch and McArthur 1974, Martin 1989) is a well-known theory that ties body fat levels to a woman's ability to menstruate. A woman with insufficient levels of fat in her body will display menopausal/amenorrheaic symptoms. Therefore, corseted women could have suffered from a cessation of menses due to insufficient levels of body fat and malnutrition.

If a corseted woman is able to conceive a child, the developing fetus must then withstand the compressive forces of the corset, and the crowding of the internal organs that resulted from the practice. Davies (1982) notes several pathologies of the fetus, which she attributes to corseting. First are the physical malformations of the maternal body that follow as a direct consequence of even "*mild* cases of compression" (Davies

1982:634, original italics). Such malformations would have certainly affected the developing fetus as well. Furthermore, the downward pressure of the organs upon the uterus increased with movement, including assuming a sitting position, and, according to Taliaferro (from Davies 1982), was a frequent cause of miscarriage and abortion.

Oxygen starvation of the fetus resulting from restricted blood flow to the uterus is also dangerous. A restricted uterine blood flow would also limit the amount of nutrients reaching the fetus and the amount of waste that could be disposed (Davies 1982). Reduced blood flow to the uterus has been recognized today in the case of monozygotic twins. In approximately 5% to 15% of monozygotic twins, one twin will dominate the other in the womb and receive the majority of the blood flow during development. The other twin, whose blood flow has been severely restricted, is much smaller than the dominant twin. The smaller twin nearly always dies, and both twins die in approximately 60% of cases (Sadler 2000). This modern example indicates the importance of an adequate blood supply for the developing fetus.

If a child could be successfully carried to term, the process of parturition may be extraordinarily difficult for the corseted woman (Davies 1982). Various researchers and doctors (i.e., Bouvier 1852, Dickinson 1887) have noted the atrophy of the abdominal muscles that accompanies tightlacing. As Bousfield (1928:167) put it, the abdominal muscles are responsible for

> holding the uterus down into the pelvis and giving it normal support when the uterine contractions take place. With little support from the abdominal muscles, the uterus may rise too high and it may rupture.

In addition, weak or atrophied abdominal muscles may hinder the woman's ability to push, and as a result, prolong the birth process, increasing the risk of exhaustion and stillbirth (Davies 1982).

The tendency for malnutrition of corseted women (mentioned above) also increased the risk of a low birth weight for the infant. Dr. J. Willocks (1977) noted the connection between stillbirth, neonatal death, low birth weight, and maternal malnutrition. Willocks states that the majority of neonatal deaths are directly attributable to low birth weight, and that low birth weight is often a result of maternal malnutrition during pregnancy.

Besides affecting the soft tissue of the body, the contemporaneous literature indicates that a reduction in the size of the pelvis itself was also a concern. Smith (1890) and others demonstrate their concern for the decreasing size of the female pelvis, and their worry that in the future, female pelves may be too narrow to allow the fetus to pass at all. Dr. Isaac Abt remarked in 1923 on the decreasing number of infant deaths and attributed this decrease to both the decline of the corset and to the improvement of procedures such as the cesarean section. Abt (1923) specifically mentions tightlacing as a cause of pelvic inadequacy, and blames the corset for increasing the rate of middle-class stillbirths in previous decades.

There is also historical literary evidence to suggest that corsets may have been used purposefully to induce abortions. Certainly, the author Émile Zola condemned the practice in his popular 1899 book, *Fécondité*. Valerie Steele (2001:9) quotes a sixteenth century manuscript which describes the demands made by a well-off fourteen-year-old girl: "a French bodie [busk], not of whalebone, for that is not stiff enough but of horne

for that will hold it out, it shall come, to keep in my belly." Steele theorizes that the girl may have been pregnant, as a busk of whalebone should have been sufficient to contain the belly of a normal fourteen-year-old. Steele also quotes poet Stephen Gosson (1595, in Steele 2001:10), "The baudie buske . . . keeps down flat/The bed wherein the babe should breed."

Leigh Summers (2001) focuses on literature relating to "blockages" of the menstrual cycle. According to Summers, pregnancy in the eighteenth and nineteenth centuries did not begin until "quickening," or movement by the fetus. Until this time (approximately four months after conception), any cessation of menses could be attributed to a "blockage," not to pregnancy. This deception was made possible in part because the medical profession was not involved until the *woman* had decided she was pregnant (Smith-Rosenberg 1985). Summers (2001) and other researchers (Conley 1991, Rose 1986) postulate that eighteenth and nineteenth century women exploited this loophole to avoid classifying menstrual cessation as a pregnancy, but rather as a pathology in the true sense. This seems to have been especially true for illegitimate children, whose mortality rate was extremely high in historical England (Conley 1991).

Certainly, advice for the removal of blockages was common in nineteenth century women's magazines and other publications (Summers 2001). Even medical professionals provided women with the means of ridding themselves of the blockages. According to Summers (2001:51), "The removal of an 'unnatural blockage' was not a criminal offence . . . and both the woman and her physician felt justified in using drugs or mechanical devices to remove the 'obstruction' and bring order to her menses."

Where turning to the professional sphere for the removal of a blockage was not an option, the “afflicted” woman had the perfect device for the task already at hand. Summers (2001) notes that the corset provided an invisible and untraceable means of ridding a woman of an unwanted blockage, and that the garment was often used as such.

As Davies (1982) points out, data on stillbirths and abortions in historical England are sadly lacking. Statistics on stillbirths in Great Britain were not kept until the 1920s. Nineteenth century writers were reluctant to discuss the topic, and even when stillbirths and abortions were mentioned, the statements made cannot be verified through any quantitative data.

Part II:

Quantitative Analysis of Corset-Related Deformation

Chapter Four: The Spitalfields Skeletal Sample: Background and Demographics

For the purposes of this thesis, the Spitalfields skeletal collection was a near perfect match. The University of Bradford in conjunction with the Friends of Christ Church, Spitalfields, excavated the skeletons in 1984 (Reeves and Adams 1993). The skeletons were excavated from a crypt in the Christ Church Cemetery in Spitalfields, London. The individuals in the sample date mostly to the eighteenth and nineteenth centuries; interments were made in that crypt from 1729 until 1857. This time frame allows for the evaluation of the impact changing styles of corsets may have had upon the skeleton.

Of the 968 individuals recovered in the Spitalfields excavation, 383 (40%) individuals were associated with legible coffin plates that provided name, age, and date of death (Molleson et al. 1993). These data allow for further biographical and genealogical study of the sample and allow researchers to test data against people of known age and sex. The Spitalfields collection is now curated by the Natural History Museum in London and has been a popular collection for research.

The economic status of the individuals in the Spitalfields sample is also ideal for this research. Those interred in the Christ Church were middle class and reasonably well off. The occupations for a portion (24.5%) of the sample are known; many were employed in the profitable Spitalfields silk industry, others were employed as skilled artisans and tradespeople, and only a few were unskilled laborers (Molleson et al. 1993).

As a whole, the general health of the adults and juveniles interred in the Christ Church crypt is comparable to other nineteenth-century London archaeological populations. Both the St. Bride's Lower Churchyard sample and the Marylebone sample are comparable to the Spitalfields sample in both economic and health status, though the St. Bride's sample is slightly less affluent than the other two (Werner 1998). The Crossbones Burial Ground sample (Brickley and Miles 1999) and the St. Luke's Church Sample (Boyle et al. 2005) display higher rates of pathology than Spitalfields, Marylebone, and St. Bride's, a difference almost certainly due to the difference in economic and social status. Those interred at Crossbones were mainly paupers and prostitutes, while the St. Luke's individuals were mostly in the lower and working classes, in comparison with the middle- and upper class individuals interred at Spitalfields, Marylebone, and St. Bride's.

Cribra orbitalia and other evidence of anemia were observed in about 34% (n=329) of the Spitalfields sample (Molleson et al. 1993). This rate is far higher than the St. Bride's sample, where only 14 individuals displayed evidence of the disease (Werner 1998). At St Luke's, only 2.6% of the skeletal sample (n=18) was diagnosed with cribra orbitalia (Boyle et al. 2005). Werner (1998) credits the higher incidence of cribra orbitalia in the Spitalfields sample to the popularity of brass and tin cookware, as opposed to iron, in the upper and middle classes. Werner posits that iron cookware would have deposited some of the metal into the food prepared within and helped to alleviate iron deficiency and the resulting anemia. In conjunction with the higher economic status of Spitalfields as compared to St. Bride's and St. Luke's, this upper-class preference for non-iron cookware may explain the relative prevalence of cribra orbitalia in the more affluent skeletal populations.

Several individuals (3.8%, n=37) in the Spitalfields sample also displayed evidence of rickets. These data are comparable to the incidence recorded for the Crossbones sample

(Brickley and Miles 1999). The fact that Spitalfields, a more affluent sample than Crossbones, has a comparable number of individuals with rickets indicates that this disease was a democratic affliction.

Approximately 87% of the individuals in the Spitalfields sample had caries on at least one tooth (Molleson et al. 1993). This high rate of caries is still lower than the rate for the Crossbones sample, where only eight of the 148 individuals were free of caries (Brickley and Miles 1999). Some individuals from the Spitalfields collection had dental corrections, such as fillings, dentures, or bridges. Four individuals had at least one filling. Nine individuals from the Spitalfields collection had dentures or bridges in place when they were interred (Molleson et al. 1993). Only one individual at St. Bride's displayed evidence of dental intervention (Werner 1998), and no dental work of any kind was present in the Crossbones sample (Brickley and Miles 1999). Had any existed in life (which is unlikely, considering the cost of dental care and the poverty of the cemetery population), the fillings, bridges, and so forth must have been taken out and resold.

Demographic data regarding age at marriage, age at first birth, and average family size exist for the Spitalfields skeletal collection. Margaret Cox (1996) researched the biographical data for as much of the named Spitalfields sample as was possible and provides an amazing and very complete array of information regarding many aspects of the lives of the Spitalfields sample. The vast majority of the adult named sample (91.5%, n=137) had been married at least once, with only 8.5% (n=22) dying unmarried.

Cox (1996) divided the married sample into three temporal periods: pre 1750, 1750-1800, and 1801-1855. Average age at marriage for females was as follows: 27.8 (range=20-38) for pre 1750, 23.4 (range=12-39) for 1750-1800, 26.0 (range=18-37) for 1801-1855. Only in the span

between 1750-1800 was the average age at marriage lower than the British national average for that time period (25.4, from Cox (1996)).

Average age at first birth for females in the pre 1750 era was 26.7 years (range=19-36). For 1750-1800 average age was 27.0 years (range=12-45), and for 1801-1855 the average age was 25.0 (range=19-33). Cox (1996) recorded the average interval between marriage and first birth for each marriage at 19 months with a range from 0 months to seven years. Cox credits pre-nuptial conception as an explanation of those intervals at the lower end of the spectrum.

In all, the latest average age at first birth is highest during the 1750-1800 time span. Average age at first birth rebounds slightly in the 1801-1855, but does not reach the same age as in the pre 1750 era. However, the 1801-1855 era has the fewest individuals associated (n=9) with the time period, as opposed to the pre 1750 era (n=21) and the 1751-1800 era (n=41); the majority of burials at Spitalfields were during the latter half of the eighteenth century, the fewest burials took place after 1800, and especially after 1820, when tightlacing became ubiquitous (Cox 1996).

Data were not available for this sample regarding interbirth intervals, but average family size of the sample decreased over time from 4.2 children pre 1750, to an average of 3.2 for 1751-1800, to 2.6 for 1801-1855. In addition, there were 5 childless couples pre 1750, 10 childless couples from 1751-1800, and only one childless couple 1801-1855, though this last time span had the least number of couples (n=27) relative to the pre 1750 (n=51) era and the 1751-1800 (n=105) era (Cox 1996).

Chapter Five: Measurements and Methods

Individuals were selected primarily on the basis of the completeness of the pelvis. Juveniles were excluded from the research sample. Adult status was determined on the basis of the fusion of the epiphyses of the long bones and of the growth centers of the pelvis. Any individual with unfused or fusing long bones or innominates was considered to be a juvenile and thus excluded. Sampling within the Spitalfields collection heavily favored female individuals. Nearly every available adult female with a reasonably complete pelvis was included in this study. After the female individuals were measured, males within the Spitalfields collection were randomly selected by individual number with the goal of examining at least 50 males.

Each Spitalfields individual selected for this study was first sexed using the sexually dimorphic features of the pelvis (Bass 1995). These features included: breadth of the greater sciatic notch, length of the pubic ramus, shape of the obturator foramen, size and shape of the pelvic inlet, and overall shape of the pelvis. In cases where the pelvis was not sufficient to indicate sex positively, length of the femora, and diameter of the femoral heads were used as corroborating data. In cases where this researcher's assessment of sex differed with the assessment of the collection register (Kruszynski 2001), this researcher deferred to the sex listed in the register.

No attempt was made by this researcher to age the individuals in this collection. In the case of the named individuals, age was known and recorded. In the case of the unnamed individuals, this researcher used the assessed age categories from the collection registrar. These categories were as such: 1 = <35 years old, 2 = 35-45 years old, 3 = >45 years old.

After the individuals were sexed, the two innominates and the sacrum were articulated and then held together with rubber bands to allow the pelvis to be measured. In all, nine measurements of the pelvis and two measurements of the femora were taken. The ribs were also examined for any deformations that may be due to tightlacing. Any obvious signs of rickets, such as the bowing of the long bones or extreme angulations of sacrum, were also noted. Other obvious signs of pathology affecting the ribs, pelvis, or femora were also noted where found.

All measurements, excepting the bi-iliac breadth and the maximum femoral length, were taken with standard 150 mm sliding calipers. An osteometric board was used to measure the bi-iliac breadth and maximum femoral length. All measurements taken are as follows:

1. Antero-posterior Diameter, Inlet (API) – Taken from the sacral promontory ventrally to the superiomedial border of the pubic symphysis. Any fused lumbar vertebrae are disregarded in this measurement.
2. Antero-Posterior Diameter, Midplane (APM) – Taken from the border between the third and fourth sacral vertebra ventrally to the inferiomedial border of the pubic symphysis.
3. Antero-Posterior Diameter, Outlet (APO) – Taken from the distal border of the fifth sacral vertebra ventrally to the inferiomedial border of the pubic symphysis. The coccyx, when fused, was disregarded in this measurement.
4. Bi-Iliac Breadth (BI-IL) – Maximum distance between the most lateral point on the right iliac crest to the most lateral point on the left iliac crest.
5. Maximum Sacral Breadth (MSB) –Maximum breadth of the sacrum, as measured across the widest point of the first sacral vertebra.
6. Transverse Diameter, Inlet (TVI) – Measured at the widest point of the pelvis between the arcurate lines.
7. Ischial Tuberosity Distance (ITD-A and ITD-P) – Measured transversely from the right to the left ischial tuberosity. Measurements were taken from both the anterior (ITD-A) and the posterior (ITD-P) borders of the ischial tuberosities.
8. Arcurate Line (AL) – Length of the arcurate line from the ilio-sacral joint to the superiomedial border of the pubic symphysis. Measurements from the left and right arcurate lines were averaged.
9. Maximum Femoral Length (MFL) – Length of the femur from the femoral head to the most distal point on the medial condyle. Measurements from the left and right femora were averaged.
10. Femoral Head Diameter (FHD) – Maximum diameter of the femoral head. Results from the left and right femoral heads were averaged.

All measurements were first entered into Microsoft Excel® to compute summary statistics (e.g., mean and median). Standard deviations for all summary statistics were obtained through the computer program Minitab®. Those females with sufficient rib preservation to assess the presence or absence of deformation were divided into two groups, females with normal ribs (F_{normal}), and females with deformed ribs ($F_{deformed}$). Normal-rib and deformed-rib males were designated in the same way (M_{normal} and $M_{deformed}$, respectively). Student's t-test and the Mann-Whitney test were used to determine the 2-tailed significance levels (with the level of significance set at ≤ 0.05) for each measurement between the two groups. These statistics were done using the statistical program SPSS®.

Chapter Six: Results

Of the 968 individuals that comprise the Spitalfields skeletal collection, 250 (25.7%) were used in this study, due to the completeness of the post-crania. Of these, 175 (69.9%) were determined to be female, and 75 (30.1%) were determined to be male. Twenty-three individuals measured were too incomplete to gain anything other than arcurate line and maximum sacral breadth measurements of the pelvis, and femoral measurements.

Figure 1 - Ribcage of a woman known to have corseted in life. Date of death is unknown. Courtesy of the Royal College of Surgeons, London, England.

Of the individuals studied, 158 had sufficiently high preservation of the ribs to assess presence or absence of compression, which I am inferring is due to tightlacing. A warping or bending of the ribs downward (Figures 1, 2, 3, 4) is associated with compression. Such deformation radically reduces the antero-posterior diameter of the ribcage, compared with normal ribs (Figures 5, 6, 7). In many cases where "down-warping" was noted, a medial twisting of the ventral rib was also noted. Steele's (2001) descriptions of potential rib deformation (after Witkowski (1889) and O'Followell (1908)) were also used to determine the causation of rib deformities.

Figure 2 – Ribs and pelvis of individual 2715, female with deformed ribs.

Figure 3 - Ribs and pelvis of individual 2090, female with deformed ribs.

Figure 4 - Rib and pelvis of individual 2219, female with deformed ribs.

Figure 5 – Normal ribs, upper thoracic (right side, superior view). From the teaching collection at Louisiana State University.

Figure 6 – Normal ribs, lower thoracic (right side, superior view). From the teaching collection at Louisiana State University.

Figure 7 – Normal rib, likely number 11 (right side, superior view). From the teaching collection at Louisiana State University.

In total, 73 of 158 individuals displayed evidence of rib compression and/or deformation, and 85 individuals did not have any significant rib deformation. There is a significantly higher proportion of women in the "deformed" category than men ($\chi^2 = 50.97$, df = 1, $p < 0.001$). The "normal" category was nearly evenly divided between the sexes (Table 1). From the total research sample (n=250, m=75, f=175), the proportion of males with normal ribs (51.9%) is much higher than the proportion of females with normal ribs (26.2%).

	Deformed Ribs	Normal Ribs	Total
Male (n)	6	40	46
Female (n)	67	45	112
Total	73	85	158

Table 1 – Males and females with normal and deformed ribs

In order to quantify the relationship between rib deformation and pelvic deformation, the means of each pelvic measurement and of age (when exact age was known) for F_{normal} and $F_{deformed}$ were compared. Among females, two means were significantly different. The arcurate line length was significantly smaller and the average age significantly younger for the $F_{deformed}$ sample. The transverse diameter of the inlet approached significance, with a significance level of 0.051 (Table 2). Once again, the $F_{deformed}$ sample was smaller than the F_{normal} sample.

For seven of the nine pelvic variables, the sample of females with deformed ribs has a smaller mean than that of the sample of females with normal ribs. The sole exceptions are the antero-posterior diameters of the inlet and of the outlet, though neither of these measurements was significantly different between the two samples.

Table 2 – Comparison of females with normal and deformed ribs by Student's t-test and Mann-Whitney test[1]

Variable	Rib Category	n	Mean (cm)	Std. Deviation	Sig. (2-Tailed)
API	normal	37	10.05	1.08	0.822
	deformed	63	10.11	1.15	
APM	normal	37	12.32	1.07	0.559
	deformed	59	12.19	0.99	
APO	normal	30	11.42	1.27	0.913
	deformed	52	11.45	1.06	
TVI	normal	38	13.03	0.87	0.051
	deformed	64	12.66	0.94	
ITD-A	normal	36	9.08	1.10	0.593
	deformed	61	8.97	0.91	
ITD-P	normal	35	12.31	1.26	0.830
	deformed	61	12.26	1.15	
BI-IL	normal	35	26.34	2.12	0.241
	deformed	61	25.84	1.89	
MSB	normal	43	11.43	0.58	0.191
	deformed	65	11.25	0.75	
AL	normal	42	11.39	0.99	0.038
	deformed	66	11.00	0.91	
MFL	normal	45	41.82	1.83	0.084
	deformed	66	41.02	2.99	
FHD	normal	44	4.19	0.26	0.128
	deformed	66	4.12	0.22	
Age	normal	9	66.11	16.44	0.042
	deformed	9	44.11	22.16	

[1]Significance levels are reported for Student's t-test, with the exception of the variable "Age," for which Mann-Whitney is used.

No variables were significantly different between the M_{normal} and $M_{deformed}$ samples (Table 3). Though these data indicate that the M_{normal} and $M_{deformed}$ samples may be considered to be the same, in future tests comparing female samples with male samples, only the M_{normal} sample was used.

Table 3 – Comparison of males with normal and deformed ribs by Mann-Whitney test[1]

Variable	Rib Category	n	Mean (cm)	Std. Deviation	Sig. (2-Tailed)
API	normal	37	9.45	1.02	0.620
	deformed	6	9.70	0.73	
APM	normal	35	11.74	1.05	0.733
	deformed	6	11.51	0.45	
APO	normal	32	10.45	1.12	0.653
	deformed	6	10.65	0.64	
TVI	normal	37	11.94	0.92	0.851
	deformed	6	12.00	0.50	
ITD-A	normal	36	7.27	0.77	0.403
	deformed	5	7.76	0.99	
ITD-P	normal	37	10.56	0.98	0.076
	deformed	6	11.41	0.91	
BI-IL	normal	35	26.04	1.96	0.900
	deformed	6	26.09	1.42	
MSB	normal	40	11.09	0.76	0.738
	deformed	6	11.21	0.72	
AL	normal	39	10.55	0.82	0.782
	deformed	6	10.70	0.61	
MFL	normal	37	44.20	2.79	0.269
	deformed	5	41.37	5.02	
FHD	normal	38	4.67	0.30	0.149
	deformed	5	4.41	0.41	

[1]Variable "Age" was removed from this test, as the $M_{deformed}$ sample contained only one individual with known age.

Table 4 – Comparison of M_{normal} and $F_{deformed}$ samples by Student's t-test and Mann-Whitney test[1]

Variable	Rib Category	n	Mean (cm)	Std. Deviation	Sig. (2-Tailed)
API	M_{normal}	37	9.45	1.02	0.004
	$F_{deformed}$	63	10.11	1.15	
APM	M_{normal}	35	11.74	1.05	0.035
	$F_{deformed}$	59	12.19	0.99	
APO	M_{normal}	32	10.45	1.12	<0.0001
	$F_{deformed}$	52	11.45	1.06	
TVI	M_{normal}	37	11.94	0.92	<0.0001
	$F_{deformed}$	64	12.66	0.94	
ITD-A	M_{normal}	36	7.27	0.77	<0.0001
	$F_{deformed}$	61	8.97	0.91	
ITD-P	M_{normal}	37	10.56	0.98	<0.0001
	$F_{deformed}$	61	12.26	1.15	
BI-IL	M_{normal}	35	26.04	1.96	0.625
	$F_{deformed}$	61	25.84	1.89	
MSB	M_{normal}	40	11.09	0.76	0.235
	$F_{deformed}$	65	11.25	0.75	
AL	M_{normal}	39	10.55	0.82	0.009
	$F_{deformed}$	66	11.00	0.91	
MFL	M_{normal}	37	44.20	2.79	<0.0001
	$F_{deformed}$	66	41.02	2.99	
FHD	M_{normal}	38	4.67	0.30	<0.0001
	$F_{deformed}$	66	4.12	0.22	
Age	M_{normal}	11	45.45	15.10	0.656
	$F_{deformed}$	9	44.11	22.16	

[1]Significance levels are reported for Student's t-test, with the exception of the variable "Age," for which Mann-Whitney is used.

T-tests were also run comparing the $F_{deformed}$ and M_{normal} samples. Comparison between the $F_{deformed}$ and M_{normal} samples showed nine variables with significant differences (Table 4). The $F_{deformed}$ sample was significantly larger than the M_{normal} sample for the API, APM, APO, TVI, ITD-A, ITD-P, and AL measurements. The M_{normal} sample was significantly larger than the $F_{deformed}$ sample for the MFL and FHD measurements. The samples were not significantly different for the BI-IL or MSB measurements, or for age. These results are comparable for the comparison of the F_{normal} and M_{normal} samples (results not shown). The only difference between these two comparisons is that the F_{normal} sample is significantly older than the M_{normal} sample.

Beyond establishing the changes in the pelvis caused by tightlacing, this thesis is also concerned with determining whether or not those changes would have affected the obstetrical adequacy of the corseted pelvis. While no data have come to light regarding typical fetal head size in nineteenth century London, head dimensions of modern fetuses may be tentatively applied to this problem. Pritchard et al. (1985) define a contracted pelvis as one with any dimension no more than 5 mm larger than the fetal head. According to this text, a contracted TVI measurement is less than 12 cm, and a contracted API measurement is less than 10 cm.

This researcher decided to focus only on contraction of the inlet because $F_{deformed}$ was significantly or approached significantly smaller than F_{normal} only for measurements of the inlet, AL and TVI. Of the females in the Spitalfields sample, 71 had a contracted API or TVI measurement. Of these, 12 females had a contracted pelvis in both dimensions. Within the 71 females with at least one contracted dimension, 30 are classified as $F_{deformed}$ (47.62% of the applicable $F_{deformed}$ sample, Table 5) and 14 are classified as F_{normal} (37.83% of the applicable F_{normal} sample, Table 5) Of those females with both dimensions contracted, 5 were in the $F_{deformed}$ sample, and 4 were in the F_{normal} sample (Table 5). A chi-square test was run to determine

whether a relationship existed between rib classification and incidence of pelvic contraction. The relationship was not significant for either the API ($\chi^2 = 0.37$, df = 1, p = 0.54; females without pelvic contraction, F_{normal} n=23, $F_{deformed}$ n=33, Table 2) or the TVI measurement ($\chi^2 = 0.12$, df = 1, p = 0.73; females without pelvic contraction, F_{normal} n=24, $F_{deformed}$ n=34, Table 2).

Table 5 – Spitalfields' females with contracted pelvic measurements (in cm) and sample status

Indiv. #	Age	API	TVI	Status	Indiv. #	Age	API	TVI	Status
2045	35-45	9.55	10.81	deformed	2444	<35	10.39	11.58	normal
2046	35-45	8.39	14.09	normal	2595	<35	8.77	12.59	deformed
2054	>45	9.69	10.79	deformed	2606	<35	8.49	12.02	deformed
2093	>45	9.21	12.80	deformed	2620	<35	9.38	11.71	deformed
2115	35-45	8.35	13.79	normal	2636	<35	10.25	11.98	deformed
2118	>45	8.61	12.51	normal	2663	35-45	9.23	13.42	deformed
2123	35-45	8.48	12.07	deformed	2667	30	10.65	11.62	deformed
2142	27	7.73	10.96	deformed	2694	<35	9.62	12.78	deformed
2160	35-45	9.01	12.38	deformed	2695	~16	11.30	11.63	deformed
2174	35-45	9.71	14.67	deformed	2705	>45	9.89	14.09	deformed
2189	55	9.11	12.80	normal	2708	37	8.74	12.30	deformed
2197	35-45	9.58	11.88	normal	2710	76	9.40	13.22	normal
2279	<35	9.45	11.52	Normal	2711	<35	9.67	12.16	deformed
2288	Adult	9.29	11.85	Deformed	2715	>45	8.68	14.59	deformed
2293	Adult	9.37	12.58	Deformed	2718	<35	9.15	12.45	deformed
2297	Adult	8.31	12.02	Deformed	2741	<35	11.70	10.65	deformed
2299	<35	9.44	13.39	Deformed	2745	>45	9.64	14.18	normal
2301	35	7.91	11.12	Deformed	2770	<35	8.49	13.52	normal
2319	<35	8.75	12.05	Deformed	2787	77	8.75	11.67	normal
2342	>45	8.81	13.36	Deformed	2790	85	8.65	13.20	deformed
2354	>45	8.65	12.59	Normal	2820	??	8.77	12.60	normal
2385	<35	9.36	12.59	Deformed	2859	<35	8.98	11.08	normal

Chapter Seven: Discussion

The goal of this study was to quantify the bony changes wrought on the pelvis by tightlacing. Females who exhibited rib deformation characteristic of tightlacing were expected to have significantly smaller pelves than females without deformation. Females with rib deformation were also expected to have significantly younger ages at death, which may be attributable to difficulties during parturition. As a corollary to both the above hypothesis, females with rib deformation were expected to display a significant relationship with pelvic contraction.

As mentioned above, corsets were ubiquitous for middle- and upper class women in eighteenth and nineteenth century England. In addition to providing the wearer with a fashionably restrained body, corsets were also symbols of a husband's prosperity. A woman wearing a corset would be greatly hampered in any physical labor, and largely unable to work. As a result, corsets became a silent status symbol, implying a life of idleness for a woman provided for by her husband (Davies 1982, Summers 2001). The Spitalfields skeletal sample is comprised mostly of middle- and upper-middle-class individuals, with a few individuals employed as laborers and domestic servants (Molleson et al. 1993). While the middle-class women would be expected to have corseted, the domestic servants and other working-class females in the Spitalfields skeletal sample would have corseted less intensely than their higher-status counterparts, if they corseted at all. Therefore, the majority of women in this sample likely wore corsets as a matter of course, while a subset would have refrained from intense tightlacing in order to work. This socio-economic difference probably accounts for the presence of females with no evidence of rib deformation.

The effect of tightlacing on the ribs is well documented by historical medical professionals such as Dickinson (1887), O'Followell (1908), Paré (1634), Soemmerring (1893), and Witkowski (1889). The data these researchers present indicate that the corset will cause the ribs to compress to a cylindrical torso shape. The extreme result of this trauma was related by Paré (1634), who described one woman at autopsy whose floating ribs were overlapping. O'Followell (1908) and Witkowski (1889) provide illustrations of corset-related trauma to the ribs (reproduced in Steele 2001). The ribcage of a known tightlacer (date unknown) on display at the Royal College of Surgeons in London (Figure 1) provides another physical example of the damage done to the ribcage by corsets. Unfortunately, this woman's pelvis was not preserved, so an assessment of the effect of tightlacing on the pelvis is impossible. In light of these examples, corroborated with the relative affluence of the Spitalfields sample, the downward warping and general compression of the Spitalfields ribs may be reasonably attributed to tightlacing.

In this study, differentiating between rib deformation due to corseting and rib pathology due to disease is paramount. Within a eighteenth and nineteenth century skeletal population, the most common diseases which may affect the ribs are rickets and tuberculosis. Rickets affects the ribs in several ways. Most noteworthy is the development of bumpy lesions on the ribs, called a "rachitic rosary." In addition to the diagnostic rosary, rickets may also cause the anterior extremity of the ribs to enlarge, creating a fan-shaped sternal end. These pathologies can result in "pigeon breast," or a prominent and anteriorly projecting sternum (Joiner 2000). Tuberculosis affecting the ribs is relatively rare (about 3% of tuberculosis cases); the disease more commonly affects the vertebral column (Chang 1992). When tuberculosis has affected the ribs, the most typical pathology is lesions on the bones themselves (Chang 1992, Chang et al. 1998). These

pathologies are distinct from the general compression of the ribs present on 158 individuals within the Spitalfields sample.

Through the comparisons of the Spitalfields' deformed rib females versus the normal rib females, a change in the dimensions of the pelvic inlet becomes apparent. Specifically, arcurate line length and the transverse diameter of the inlet were more constricted in deformed females than in normal females (though the latter variable only closely approached significance). These results indicate a general compression of the obstetrical pelvis that is associated with tightlacing. In addition, maximum femoral length was shorter in females with deformed ribs versus normal ribs, though this variable also only approached a significant difference. A shortened femoral length indicates that the females with deformed ribs may have been slightly shorter than their normal-rib counterparts.

Though the bi-iliac breadth averages slightly smaller in females with deformed ribs than in females with normal ribs, the difference between the means is not significant. The lack of statistical significance for the bi-iliac breadth is surprising, as the physiological evidence seemed to indicate that the upper part of the ilia would be more subject to deforming pressure than the pelvic inlet. Considering the fact that the mean difference for the transverse diameter of the inlet closely approaches significance, there appears to be some confounding factor at work.

Several factors may explain this finding: tightlacing may affect the transverse diameter of the inlet independently of the bi-iliac breadth, or the bi-iliac breadth may be more resistant to deformation than the transverse diameter of the inlet. The difference between the two transverse diameters might also be a product of the *relative* change in size of the transverse and bi-iliac diameters. The actual difference in the mean of the two measurements is nearly the same (0.37 cm for the transverse diameter of the inlet and 0.50 cm for the bi-iliac breadth). However, the bi-

iliac breath is approximately two times the transverse diameter; therefore an equal absolute change closely approaches a significant difference between the means for the one measurement and not for the other.

Another explanation for the lack of significance in the bi-iliac breadth is that the deformed shapes of corseted pelves are not a product of compression, but rather of stunted or deformed development in young adulthood. The shape and orientation of the ilia may be determined early in adolescence with the fusion of the ilia, pubes, and ischia, which begins at age twelve (Bass 1995; Burns 1999). In contrast, the pubis, an important determinant of both the transverse diameter (Rosenberg 1988) and arcurate line length, continues growth until early adulthood (Tague 1994). As stated above, mothers usually began corseting female children around the onset of puberty (Steele 2001, Summers 2001). Therefore, the pressure and constriction of the corset would have a longer period of time to affect the development of the pubis than the orientation of the ilia, and so the transverse diameter of the inlet and arcurate line length would be more significantly changed than the bi-iliac breadth.

Additionally, among females for whom exact age is known, the sample with deformed ribs averaged significantly younger than the sample with normal ribs. This significant difference indicates that there is a lower life expectancy which may be associated with rib compression and therefore with tightlacing. Whether the earlier age at death of the sample with deformed ribs is due to complications during childbirth or to various corset-related diseases is unclear. Nevertheless, these results conform to the stated hypothesis. However, as the M_{normal} sample is also significantly younger than the F_{normal} sample, the small number of individuals for whom exact age at death is known makes any generalizations in this regard uncertain.

Maximum femoral length approached significance. This measurement is correlated with stature, and may indicate that the females with deformed ribs averaged slightly smaller than females with normal ribs. However, shorter stature of the $F_{deformed}$ sample does not likely account for the significantly shorter AL measurement and nearly significantly shorter TVI measurement in that sample. Tague (2000) demonstrated that there is no significant correlation between femoral length and arcurate line length. Moreover, though he showed a significant correlation between femoral length and the transverse diameter of the inlet, this correlation is negative.

As mentioned in previous sections, researchers (e.g. Davies 1982, Steele 2001) have commented on the corset's effect on a woman's ability and desire to eat. Davies (1982) theorized that many corseted women would have suffered from malnutrition due to a reduced food intake. This theory offers an alternative explanation for the higher rates of cribra orbitalia seen in higher-status historical cemetery populations (Chapter Four). As this researcher did not collect data regarding general health in the individuals studied, a statistical comparison of the relationship between stature, evidence of anemia, and tightlacing cannot be made. However, the nearly statistically significant reduction in stature for the sample of females with deformed ribs indicates that some developmental stress may be occurring in these females.

The fact that six males in the Spitalfields sample display evidence of rib deformation (Table 1) is not surprising. The Christ Church crypt was in use from 1729 to the mid-nineteenth century. Corseting only became an explicitly female phenomenon during the latter half of the 1830s. Until this point, males of the upper class, the nobility, and the military regularly engaged in corseting to achieve a cleaner line of body and a more athletic build (Crawford and Guernsey 1951, Kunzle 2004). Kunzle (2004) also hypothesized that the corset was especially symbolic for military men, for whom the corset represented rigid control over the body, and therefore by

association, rigid control over the emotions and the mind. Information regarding dates of birth and death is available for only one male of the six in the corseted sample: William Edmunds (individual 2178) lived from 1774 until 1812 (age 36).

Though the data indicate that tightlacing did compress the obstetric pelvis, the pressure inflicted was not sufficient to change significantly the adequacy of a corseted pelvis. Both the F_{normal} and $F_{deformed}$ samples are significantly larger than the M_{normal} sample in most pelvic measurements.

Moreover, there is no significant difference in the incidence of pelvic inlet contraction between females with deformed ribs and females with normal ribs. However, the literature (e.g., Dickinson 1887) suggests that the compression of the thorax with resulting displacement of the organs was probably sufficient to inhibit fetal development. Haller and Haller's (1974) research indicates that late nineteenth century physicians were concerned with the narrowing of the pelvis in corseted females. Leigh Summers (2001) also cites numerous medical sources that tie tightlacing to both spontaneous and induced abortions.

Data on rates and numbers of abortions and miscarriages, whether caused by corsets or not, are slim and consciously vague. Eighteenth and nineteenth century prudery precluded any open discussion or even recording of such delicate and controversial subjects. However, data are available on other reproductive maladies that have been linked with tightlacing, such as uterine prolapse and chlorosis (see previous chapters).

In addition to affecting the reproductive organs directly, corsets also indirectly affected fecundity. Chlorosis, discussed above, resulted in amenorrhea, making conception impossible. Taken with the other symptoms of chlorosis, such as fainting, headache, and fatigue, as well as

the pain caused by uterine displacement, tightlacing may have served to depress the sex drive, reducing opportunity and desire for intercourse and thereby affecting fecundity.

Further research along several avenues would build on and expand the data gathered in this research. First, a skeletal sample of roughly the same economic status from the latter half of the nineteenth century would be more suited to studying the effects of tightlacing, as the practice was most widespread after 1840 (Summers 2001). In addition, a skeletal sample from earlier centuries would help to give time depth to the study of tightlacing on the human body.

Temporal Changes in Corset Style

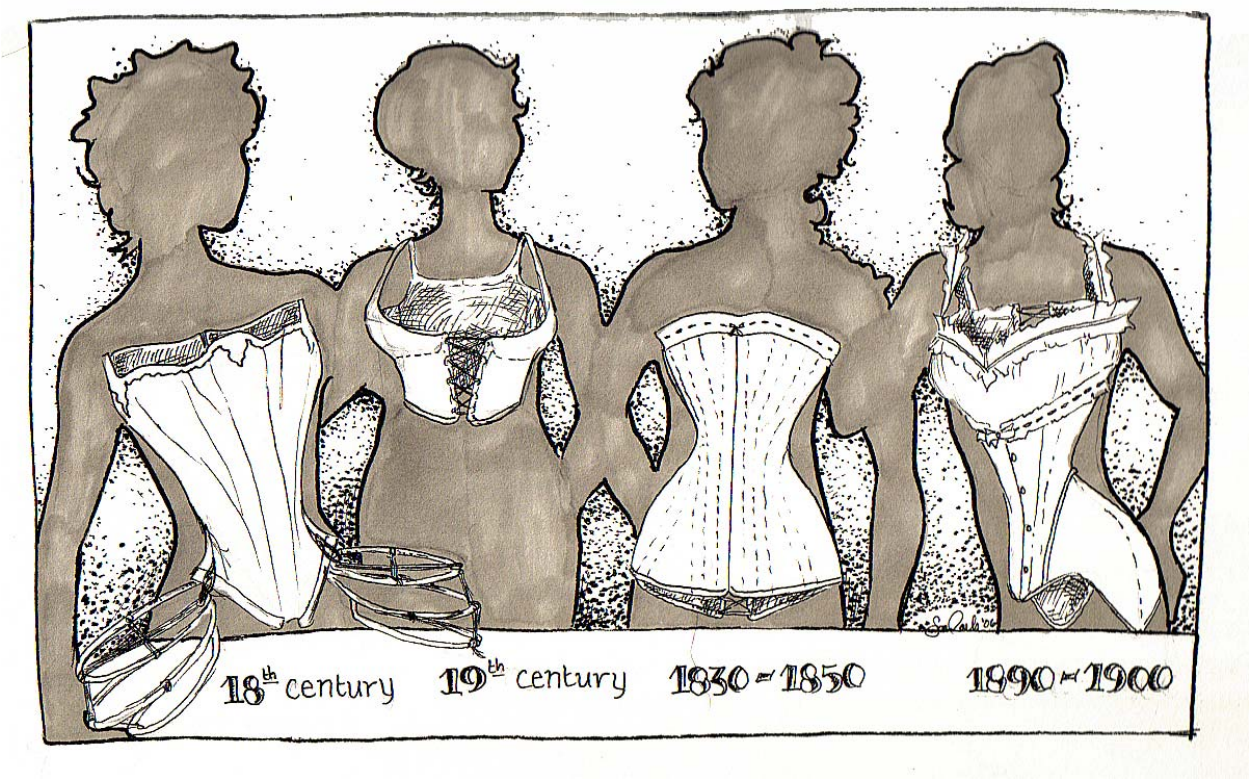

Figure 8 – Examples of changing corset styles over time. From left to right: 1) Typical corset design for the majority of the eighteenth century, ending at the navel. The extensions on either side are panniers. 2) "Zona" style bodice, producing minimal compression. 3) Hourglass corset in vogue after 1814, until the latter half of the nineteenth century, corsets ended at the top of the iliac crests. 4) Example of the extent to which the corset covered the hips and buttocks. Illustration by Sally Carraher, after Crawford and Guernsey (1951).

The interments at the Spitalfields crypt date from 1729 until 1857. Within this time period, the corset underwent dramatic physical changes. In the eighteenth century, the cylindrical torso was in vogue and corsets ended at the level of the navel. Panniers attached to the bottom of the corset, but did not constrict the hips (Crawford and Guernsey 1951).

In the first decade of the nineteenth century the neo-Grecian "zona" style provided a brief respite from overly compressive garments, but around 1814 the corset came back into vogue. The cylindrical body was no longer in fashion; it had been replaced by the hourglass figure. It is also in the nineteenth century that the corset began to bind the hips as well as the torso. By the 1830s, the corset ended at about the level of the superior border of the iliac crest. With the passing decades, the corset came lower over the hips until the final decades of the nineteenth century and the first decades of the twentieth century, when the lower border of the corset covered the hips and the buttocks, and therefore bound the entire pelvis (Crawford and Guernsey 1951, Leoty 1893).

Therefore, individuals from different style periods could be expected to display different patterns of deformation. Tightlacers in the eighteenth century would most likely display deformed ribs, but the pelvis would have been relatively unaffected. Individuals who engaged in the zona style of dress may not have deformed ribs at all, while tightlacers who lived in the later three-quarters of the nineteenth century would be expected to display both deformed ribs and pelves.

The changes in corset style and accompanying deformations over the time span represented by the Spitalfields collection could explain the lack of significance in measurements such as the bi-iliac breadth or the antero-posterior diameter of the inlet. Excluding any females who may have engaged exclusively (or most intensely) in the zona fashions, rib compression

would be present for individuals who engaged in tightlacing in both the eighteenth and nineteenth centuries, but only individuals from the nineteenth century would be expected to display deformation of the pelvis. Unfortunately, there are simply not enough individuals within the $F_{deformed}$ and F_{normal} samples to divide the Spitalfields individuals temporally. An examination of a skeletal population of similar socio-economic status but of a later time period may help to clarify the relationship between rib and pelvic deformation.

The Tyranny of Fashion: Modern Analogues to the Corset

As fashions change, so do the requirements for the bodies that underlie the clothing. The demands on the fashionable body are just as severe as those of fashionable clothing. However, the body is not as changeable as dress, and the demands of fashion can exact a harsh toll upon an unfashionable body.

The shapes of fashion in the nineteenth century and in the modern day are in many ways opposite ends of the spectrum of the female form. The corseted figure of the nineteenth century cinched in the waist while accentuating the bust and hips. The hourglass figure produced by the corset emphasized the secondary sex characteristics of the female form: the breasts and the hips and buttocks. In contrast, the fashionable body in the modern day (in truth, since the 1960s) deemphasizes the waist, creating a more-or-less straight line from underarm to hips. The breasts and buttocks are not generally emphasized, though this is beginning to change. In sum, the fashionable body was transformed from an exaggerated, over-feminine silhouette to a form that has more in common with a prepubescent girl than a grown woman.

Though corsets as a garment are no longer a requirement for a fashionable body today, Valerie Steele (2001) argues that a modern incarnation of the corset does exist, which she terms

the corset of the hard body. According to Steele (2001:143), "The corset did not so much disappear as become internalized through diet, exercise, and plastic surgery – known euphemistically as 'body sculpting'." That is, in the modern day external, mechanical means of body molding are no longer used, but the desire for a sculpted body is still present. Therefore, modern women must rely on internal (and medical) means to achieve the body required by fashion.

Tightlacing also has an obvious analogue in modern eating disorders, most particularly anorexia nervosa. Historical literature regarding this disorder implicates tightlacing as an aid to the anorexic (see sources in Davies 1982) as a tightlaced woman significantly reduced her ability and desire to eat.

Showalter's (1985) research on mental illness in the nineteenth century mentions the "fasting girls" of that era. Several of these cases made national news. Anorexia nervosa was only recognized as a mental illness in 1873, interestingly by Dr. William Gull, personal physician to the royal family and future suspect in the Jack the Ripper case. In popular literature, a softer form of anorexia was extolled as a trait of the virginal heroine (see sources in Showalter 1985). Showalter (1985:129) states, "in the rigid control of her eating, the anorexic both expressed her fear of adult sexual desire [through stopping her menstrual flow] and enacted an exaggerated form of the deadening life of the dutiful daughter." In other words, the chastity and duty embodied in the anorexic played into the nineteenth century ideal of the wife but more especially the daughter, who could remain young and pure so long as menarche did not occur.

In modern times, anorexia and bulimia are widespread problems, especially in the West. Anorexia is classified by the American Psychiatric Association's (2000) *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) as an axis I disorder. Anorexia today is

defined as any person who "weighs less than 85% of what is considered normal for that person's age and height" (Davison and Neale 2001:223). The connection between depression and anorexia is also universally recognized. Although rates of recovery for anorexics are increasing, the disorder still maintains the highest fatality rate of other axis I disorders (Davison and Neale 2001).

Radical weight loss, to the end of achieving the incredibly thin body type, is the forebearer of many health complications, which can include weakness, tiredness, bone loss, congestive heart failure, and sudden death. Anemia and amenorrhea are also consequences of anorexia (Davison and Neale 2001). Without sufficient body fat, the menses cease. There is a direct parallel here to the amenorrheaic symptom of chlorosis that is brought about by tightlacing.

Anorexia, and truly, all eating disorders, spring primarily from a distorted body image. That is, the anorexic believes she is fat and continues in this belief regardless of the amount of weight she loses (Davison and Neale 2001). This parallels the body image of nineteenth century women, who could not achieve the necessary hourglass figure and tiny waist without mechanical intervention. There is irony in that both these phenomena arise from a distorted body image and, yet, result in a distorted and unnatural body.

Another parallel exists in the manner in which both the tightlacer and the anorexic are viewed by the medical profession. In both cases, the tightlacer and the anorexic are the focus of pity, and effort is made in each case to "fix" the afflicted woman. Yet underlying this is a feeling of frustration with the sufferer, since in both cases the woman is usually averse to stopping her body-modifying regimen. A common theme in eighteenth and nineteenth century medical literature laments the ubiquity of the corset while at the same time disparaging the female for

being too weak and vain to abandon their harmful tools of fashion. To sum, in the words of Davies (1982:622), “fashion is usually stronger than expert medical appeal or common sense.”

Conclusions: Waisted Efforts

The change in the corset from a unisex garment to a highly gendered female garment has been intensely researched in the literature, but little research has been done osteologically. Through the data presented here, the hypothesis stated in the introduction can be accepted. These data demonstrate that tightlacing did significantly affect the size of the female obstetric pelvis, specifically, the width of the transverse diameter of the inlet and the length of the arcurate line, making the corseted pelvis smaller.

Within the Spitalfields sample, females with deformed ribs had a 0.37 cm smaller TVI measurement and a 0.39 cm smaller AL measurement than women with normal ribs. In addition, a large number of females (n=71, 40.57% of the total female sample) had at least one contracted pelvic dimension. However, females with deformed ribs still had significantly larger pelvic dimensions than males with normal ribs, and there is no significant difference between females with normal and deformed ribs in the incidence of pelvic inlet contraction. These data make the determination of a reduction in obstetric sufficiency for the Spitalfields females difficult. However, there is ample historical data to suggest that the compression and displacement of the soft tissue and internal organs could be responsible for any reduction in fecundity among nineteenth century women. Diseases such as chlorosis and conditions such as uterine displacement and prolapse certainly would have reduced fecundity in tightly laced women.

Researchers (Davies 1982, Haller and Haller 1974) have claimed that changes in pelvic size due to tightlacing would lead to problems of fecundity and parturition. While this cannot be stated conclusively on the basis of the results of this study, the general reduction in pelvic inlet size due to tightlacing may have been detrimental to fecundity and parturition.

These data also substantiate the theories of both modern and historical researchers who warned about the dangers of tightlacing, both in the sense of general health and of fertility and fecundity. There is a significant change in pelvic size associated with tightlacing. If the compressive forces of the garment were sufficient to change the size of the pelvis, then the damage done to the internal organs must have been considerable.

The temporal mismatch of the literary medical data and the osteological data from Spitalfields means that comparisons between the two must be cautious. The vast majority of medical data regarding corset-related pathologies are from the latter half of the nineteenth century, when waist size relative to body size reached an all time low (Davies 1982). The Spitalfields collection is from the eighteenth and early nineteenth centuries, an era with little available medical data.

The presence of males within the corseted group at Spitalfields indicates that while tightlacing was mainly a female phenomenon, the physiological impact of tightlacing on the male physiology is a subject that deserves further study. Little research has been done on tightlacing and male health. Such a study would provide a meaningful counterpoint to the considerable number of books and articles regarding female health and tightlacing. Perhaps most interesting would be the medical community's reaction to and diagnoses of corset-related diseases in males. The differential treatment of men and women by the medical community is well documented, both in the modern day and in the historical record (e.g., Showalter 1985).

The literary data also closely tie the practice of tightlacing to eating disorders, most specifically anorexia nervosa. As stated above, there is historical and literary evidence (Davies 1982, Showalter 1985) that ties corsets to the practice of anorexia in the nineteenth century. As a modern-day analog, this comparison illustrates the extremes to which some women will go in

order to achieve a fashionable body. The commonalities between the corseted body and the anorexic body lend silent testament to the incompatibility of the "ideal" female form with the true female form, and also to the continuing, long-standing unreality of the fashion world. The medical arguments against the corset in the nineteenth century are startlingly similar to the arguments made against eating disorders and, in the case of young girls, plastic surgery. In the examination of these continuing problems, one is reminded of the old adage: "the more things change, the more they stay the same."

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Appendix A: Traditions and Fetishes: The Corset Today

Though the corset itself has gone out of style as an article of everyday clothing, the practice of corseting continues among a segment of the modern population in Europe and North America. Today, the corset is inseparable from its sexual connotations. Indeed, in many cases, the wearing of corsets or tightlacing is considered fetishistic or sexually deviant. While the corset has (and, indeed *had*) sadomasochistic aspects, this is not the garment's only mode in the modern day.

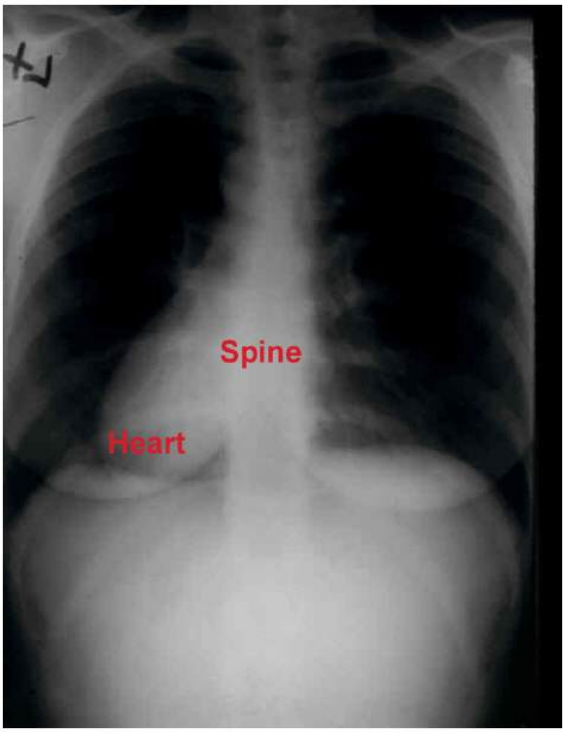

Figure 9 - X-Ray of Cathie Jung's ribcage before corseting. Used with kind permission of Cathie and Robert Jung.

Tightlacing is still practiced in modern times. Cathie Jung is the Guinness World Records holder (2004) for "Smallest Waist on a Living Person"; Ms. Jung's waist measures 11 inches in circumference. According to the Guinness website (2004): "Cathie Jung's waist is about the same size as a regular jar of mayonnaise." In order to achieve this incredible waist size, Ms. Jung has been wearing corsets 24 hours a day for the past 23 years (personal communication 2005). But as Cathie Jung says, the size of the waist does not matter, it is the illusion provided by the contrast between the waist and the hips and bust that makes the corseted torso so dramatic.

Cathie Jung met her husband-to-be at Tufts University, where she was attending as a biology student and he as a pre-med student. Mrs. Jung first became interested in corseting as a companion to Victorian dress, which both Cathie and Robert Jung enjoy. Mrs. Jung was seeking authenticity in her dress, which required corsets in order to achieve the proper silhouette.

Mrs. Jung does not consider corseting to be the radical body modifier that some do. As she says, “in the fifties, we all had waists” (personal communication, 2005). Fashion in the 1950s, especially fancy clothes such as party dresses, required compressive undergarments such as girdles and merry widows to define the waist. While these undergarments did not compress the torso as radically as a corset, they still served to emphasize the waist. To Mrs. Jung, this type of silhouette is more appealing than the straighter lines popular today. Mrs. Jung also credits movies from the era such as *Gone with the Wind*, *Showboat*, and *Seven Brides for Seven Brothers* for romanticizing and glamorizing corsets.

Cathie Jung wore her first corset at her wedding in 1959. She continued to corset on and off for the next 24 years, until in 1983 she began wearing a corset full-time. The delay in beginning active waist training was due to several factors. Robert Jung was starting up a medical practice in their small hometown in Connecticut, and the Jungs wished to establish themselves in the community. Cathie Jung also balanced motherhood with her corseting; she has had three children, all of whom were grown by the time she began corseting full time.

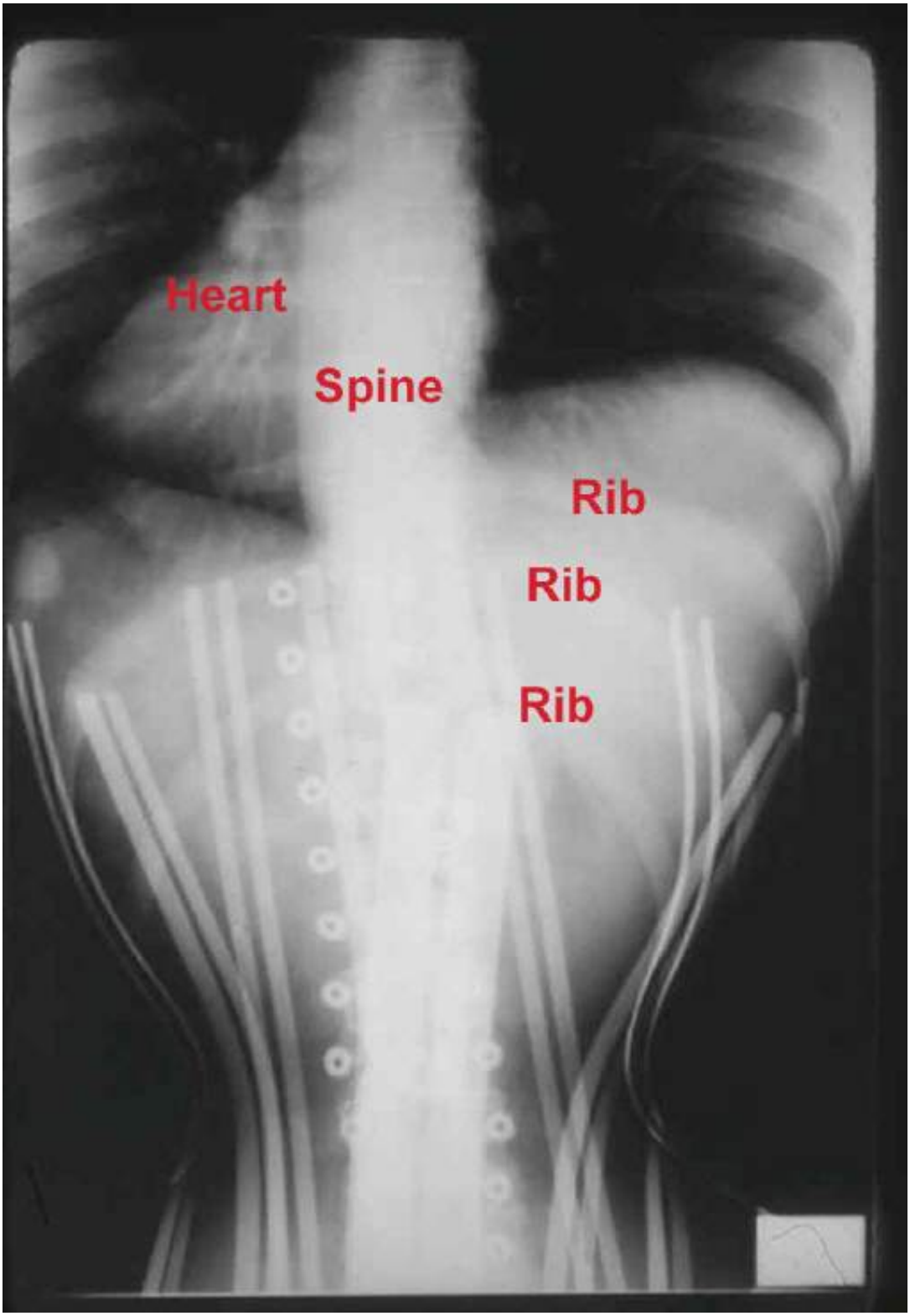

Figure 10 - X-Ray of Cathie Jung wearing her corset. At this time (1998), her waist measured 15 inches in circumference. Used with kind permission of Cathie and Robert Jung.

One of the greatest factors affecting the start Cathie Jung's waist training was the lack of organization within the corseting community and the limited availability of corsetieres in the United States. With much searching, the Jungs were able to find a corsetiere in California called BRC. Through the connections made at BRC, including a bi-monthly newsletter, the Jungs were able to connect with the corseting community in Europe, which is more well-developed and organized than in the United States.

Cathie and Robert Jung were among the first members of *Les Gracieuses Modernes* (LGM), a modern-day corset-wearers organization based in Europe. The organization was founded in 1982 by Rudi van Grinkel. LGM's members include male and female tightlacers who wish to "popularize the wasp-waist . . . as an enrichment for the everyday clothing" (*Les Gracieuses Modernes* 2003). LGM holds several annual balls and workshops, which members can attend to dress in and learn about corsets.

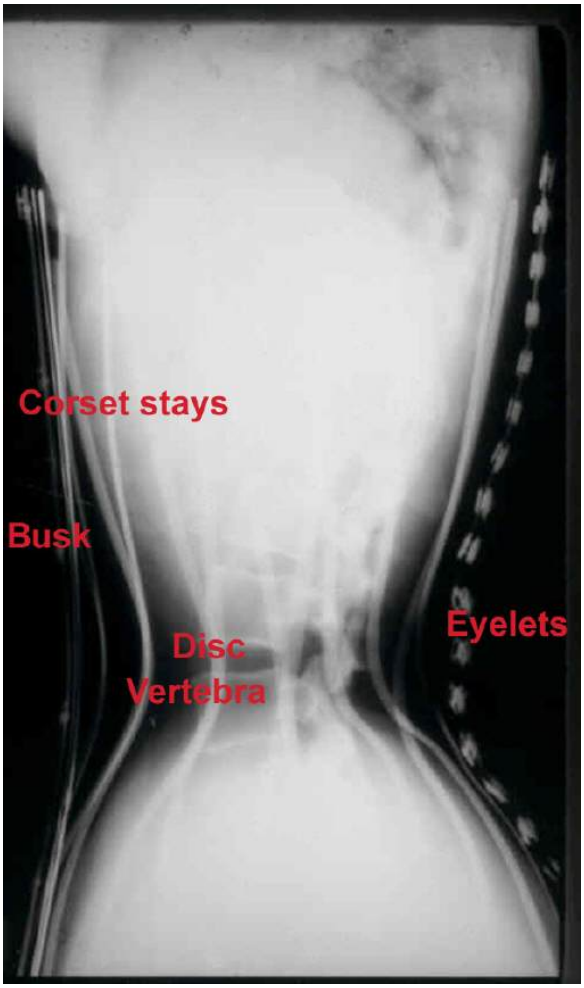

Figure 11 - X-Ray of Cathie Jung in her corset (left profile). Used with kind permission of Cathie and Robert Jung.

In the early days of the organization, dress at the balls revolved around period clothing and black tie, and the Jungs attended nearly every year. Friendly competition among the female members of LGM focused on having the bigger dress and the smaller waist

(Cathie Jung personal communication 2006).

In recent years, the concentration of LGM has shifted from traditional to fetish dress. The balls today incorporate a wide range of styles from classic dresses of the seventeenth, eighteenth, and nineteenth centuries to modern fetish and leather ensembles. This eclectic mix is not to everyone's taste. The Jungs have stopped attending the balls; the fetish bent of the 'new' LGM does not appeal to them.

Though she has been corseting on and off since 1959 and full time since 1983, Cathie Jung has suffered no health complications or reduced physical abilities due to her corset. Though keeping her skin dry and a slight atrophy of her abdominal muscles are slight problems, neither is serious enough to impact her life or general health.

Mrs. Jung's good health is rather confounding given the scope of this research. Numerous sources describe at length the debilitating effects of tightlacing. These accounts may be slightly exaggerated, as secondhand observers, not the tightlacers themselves, wrote them. Another possibility is that Mrs. Jung's good health may be a result of her long-term waist training; a reduction of 15 inches over 23 years gives the body ample time to adjust to the compression. Mrs. Jung did not have a set goal in mind when she began tightlacing seriously; she simply bought a smaller corset when she could lace her current one closed. This gradual reduction is a far cry from the London girls' school (mentioned above) that reduced its students' waists by one inch every month.

For many modern tightlacers, health is an important consideration. Now that the dangers of corseting are fairly common knowledge, modern tightlacers want to avoid complications such as prolapsed uterus. This concern is illustrated by the website for the Long Island Staylace Association (2006), a long-standing community of tightlacers based

in the United States. The association's website is comprehensive, and includes medical advice on everything from itching and muscle retention to scoliosis, prolapsed uterus, and hemngioma. The site also has a forum where people can ask questions and receive answers from the corseting community. One forum on the site was dedicated to the discussion of pessaries and other uterine support devices. The forum included information on where to purchase a pessary, how to decide which type to use, and how to get one fitted. The site has dozens of other topics for discussion, covering nearly every aspect of corseting. In all, this site provides a reliable community for modern American tightlacers.

Vita

Katherine Klingerman's interest in archaeo-osteology began at the tender age of five, when her father caught her going out to the pet cemetery in the backyard with a shovel so she could look at the bones. In her undergraduate studies at the University of Vermont, Katherine made a swift transfer from a major in theatre to the slightly more employable field of anthropology. During her time in Vermont, Katherine completed an undergraduate thesis examining the often vast differences between literary historical evidence and archaeological evidence.

Still feeling she had much more to learn about anthropology in general and osteology specifically, Katherine applied to and was accepted by the Department of Geography and Anthropology at Louisiana State University. At LSU, Katherine was awarded a graduate assistantship, as well as a Robert C. West and R.J. Russell Field Research Award to carry out her thesis research. Katherine has volunteered at the FACES lab at LSU, under the direction of Mary Manhein, and has assisted in several forensics cases. Katherine is also engaged in the professional sphere, attending several conferences in the past few years including the AAPA and the AAFS meetings. Katherine plans eventually to pursue a PhD in anthropology, and, at some point, possibly even become one of the employed.

The diversity of the discipline and the variety of subjects available for study within all the sub-fields of anthropology still maintains a firm grip on Katherine's academic interests, and it is unlikely that this grip will loosen anytime soon.