**UNIVERSITY OF READING**

# A WOMAN'S WORLD:
# A BIOARCHAEOLGICAL APPROACH TO THE ROMANO-BRITISH FEMALE LIFE COURSE

**Submitted for the Degree of Doctor of Philosophy**

DEPARTMENT OF ARCHAEOLOGY
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# DECLARATION OF ORIGIONAL AUTHORSHIP

“I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged. “

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# ABSTRACT

This thesis examines Romano-British women using a life course approach and from a holistic perspective by combining archaeological, historical and biological information.

Within the female life course three physical events or transitions occur which directly relate to shifts within society: puberty, childbirth and menopause. These transitions were explored using 436 females between the ages of 10.0 and 44.9 from 11 southern Romano-British urban centres. These sites are of different legal status and size, with some examples bordering between urban and rural, providing insights into the lower status and local populations as well as towns of higher legal status. All individuals are dated to the later ($2^{nd}$ – $5^{th}$ century) Roman period.

The Females between 10.0 and 24.9 years of age were included within the puberty subsample (n=136) and placed into six categories ranging from Initiation to Completion. Puberty primarily took place over 5 years with a mean age for menarche of 14.1 years. The shape and development of the pelvis also directly impacts a successful pregnancy and vaginal birth. Based on measurements of the pelvic inlet, midplane and outlet, 398 females were assigned to three categories: no contraction, at-risk and high risk. Within the sample, 100% (n=12) of females aged 13.0-15.9 years and 78.6% (n=11) of those between 16.0 and 17.9 years were contracted. Therefore, is highly unlikely that women under 18 years were frequently able to deliver vaginally. The developmental obstetric dilemma (DOD) hypothesis was investigated through pelvis typology and pelvimetry. Pathologies and morphological changes associated with obstetrics including prematurely fused coccyx and osteophyte growth were also examined as potential hazards. Stature, body mass (BM) and Body Mass Index (BMI) were determined based on femoral measurements.

This research is the first to explore the female life course using a bioarchaeological approach to puberty and childbirth.

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# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# 1 INTRODUCTION

## 1.1 BACKGROUND AND RATIONAL

During the 19th and 20th centuries the study of women in past populations, including Roman Britain, was primarily text-based and heavily androcentric (Dixon, 2001; Foxhall, 2013; Gilchrist, 1999; Nelson, 2007). Studies placed an emphasis on the roles of women within the home, in relation to men, and explored superficially through artefacts such as jewellery (Carcopino, 1940; Ferrero, 1911; Casson, 1975; Allison, 2006). Although Watts (2001; 2005) attempted to bridge this gap through a bioarchaeological perspective, her work has been heavily debated among scholars who feel it is unsubstantiated and has served only to complicate scholarship on the Romano-British female life course (Cool, 2007). Recent research by Eckhart (2014), Allison (2015) and Redfern and Cox (2013) have placed an emphasis on Roman women through interdisciplinary methods but failed to incorporate a gendered life course approach.

Primary written sources, such as Soranus, Galen and Rufus are also problematic because they focus on upper-class women living in and around ancient Rome; nevertheless, they remain the core reference material for determining pubertal timing, age at menarche and childbirth practices. However, recent advancements in osteological methods allow for a new perspective on the subject, particularly with the incorporation of clinical methods based on female development including determining pubertal timing and age at menarche (Shapland & Lewis, 2013; 2014). The result of their research allows for a new approach to discussing the female life course. Until this point, determining age at marriage stemmed from inscription studies (Hopkins, 1965; Shaw, 1987) and primary written sources. While bioarchaeological evidence does not provide a specific age at marriage or motherhood, it allows the physical development of females to be considered when discussing events and transitions within the life course.

As it is used in a range of fields, the definition for life course can be problematic (Alwin, 2012). According to the World Health Organization (WHO) a life course approach emphasises a temporal and social perspective (International Longevity Centre- UK, 2000). This is done through examining the life experience of an individual, as a cohort or across multiple generations to determine patterns in development, along with life events and transitions. Additionally, it incorporates how health and development are influenced by wider social, economic and cultural contexts. In the medical field, a life course approach is used to study the physical and social hazards which can occur during different periods of development such as gestation and adolescence which influence chronic disease and health risks. In the social

sciences, the life course approach focuses on life transitions and events which influence an individual's life.

Pregnancy and childbirth in archaeology is often centred on evolutionary trends or the obstetric dilemma (Kurki, 2011; Weaver & Hublin, 2009; Huseynov, et al., 2016). These approaches both focus on the need for women to give birth assisted by others and the role of bipedalism in pelvic shape, (Warner, et al., 2015; Wells, 1975) along with detecting parity status through parturition scars (McFadden & Oxenham, 2017; Holt, 1978; Kelley, 1979; Cox, 1989; Ubelaker DH, 2012), all of which are highly debated and problematic. Studies focusing on childbirth or pregnancy in Roman Britain have typically centred around concepts such as neonatal burials which are often found outside of planned cemeteries (Millett & Gowland, 2015; Moore, 2009), weaning (Fuller, et al., 2005), and infanticide (Engels, 1980; Harris, 1982). To-date, no studies have been conducted examining potential obstetric hazards including previously published morphological or pathological changes which can influence pregnancy or childbirth outcomes using a past population and it is this gap in the literature this study aims to fill.

## 1.2 RESEARCH AIMS

This research aims to investigate the physical and social development of urban Romano-British females with the goal of gaining a better understanding of the female life course. In this study a combined medical and social science approach to the life course is used and this is explored with a focus on early major life transitions including puberty, marriage, and childbirth, alongside skeletal development using qualitative and quantitative research methods. Additionally, it aims to bring together an interdisciplinary approach including archaeology, anthropology, and history to examine ideas of age, gender identity, biological sex and cultural norms.

### *1.2.1 Aim and objectives*

The aim of this study is to:

- Apply a feminist, gendered theory approach to the Romano-British female life course, including major events and transitions, using an interdisciplinary approach focusing on human remains.

Objectives of this research include:

- Testing new or underutilized methods to determine pubertal timing, gaining a better understanding of obstetrics hazards, and to explore potential pathological or morphological changes which may influence success in vaginal childbirth.

### *1.2.2 Research Questions*

The thesis aims to explore the following questions:

- How can bioarchaeological studies incorporate feminist and gender theory, alongside at life course approach?

- Are bioarchaeological findings, determined by new methods for pubertal timing and age at menarche in females from Roman Britain. supported by primary Roman literary sources?

- What age did women in Roman Britain reach menarche and how did this potentially influence their life course?

- Is the developmental obstetric dilemma (DOD) hypothesis supported in an archaeological context?
    - If so, how does the female pelvis change throughout the life course and are their potential implications for success in vaginal childbirth?

- Does the high rate of females found in archaeological samples correspond to rates of obstetric hazards?
    - If so, what potential pathological or morphological changes which may influence success of pregnancy or natural (vaginal) childbirth are present?

- Are findings or methods used within this study suitable for determining parity in past populations?

- What pathologies or morphological changes should be considered going forward when examining obstetric hazards?

## 1.3 OUTLINE

The lives of Roman women have often been discussed through a patriarchal lens; however, this can be overcome through incorporating feminist and gender theory alongside bioarchaeological methods. Additionally, previous work which has attempted to tackle the Romano-British female life course has often been deemed lacking due to poor methods or an overdependence on material culture. To overcome this, a life course approach which incorporates written sources, material culture and bioarchaeological evidence should be used (Chapter 2). Within the Romano-British period, women lived a gender specific life course with a range of events and transitions their male counterparts would not have experienced. This partially reflected the Roman concepts of ageing which focused on male development. Other aspects of the female life course including gendered play, formal and informal education along with marriage contracts and ceremonies illustrate their gendered experience and the overall outlook towards women during this period (Chapter 3). While modern clinical approaches towards puberty traditionally focus on external cues such as breast development or body hair growth, when

working with a skeletal sample it is impossible to use such methods; therefore, it is necessary to use a separate set of markers based on x-rays to determine the various puberty stages and age at menarche. Pregnancy and childbirth pose a range of potential hazards resulting in miscarriages or difficultly in childbirth; however, previous studies have focused on the evolutionary aspect of the 'conflicting' forces of bipedalism and giving birth to large brained neonates. Similar to puberty, assessing childbirth and related obstetric hazards in modern clinical settings relies on soft tissue measurements which cannot be translated to the skeletal pelvis. Therefore, it is necessary to focus on skeletal changes such as osteophyte growths and pelvimetry to explore birth hazards (Chapter 4). Within the study, Romano-British urban and semi-urban populations were explored through determining puberty and potential obstetric hazards. This allowed for a bioarchaeological approach to the Romano-British female life course (Chapter 5). The results of the two subgroups, puberty and childbirth, are presented and include age at menarche along with rates of contraction among female pelvises (Chapter 6). The results are further discussed with particular attention to the developmental obstetric dilemma (DOD) hypothesis and how bioarchaeological evidence can further our knowledge of the Romano-British female life course (Chapter 7). Further research and overall conclusions, highlighting the importance of incorporating a feminist gendered approach to bioarchaeological studies, are discussed (Chapter 8).

# 2 ANTHROPOLOGICAL AND HISTORICAL APPROACHES TO THE LIVES OF ROMAN WOMEN

## 2.1 INTRODUCTION

Prior to the 20th century, many academic fields were male dominated and lacked discussions on gynocentric topics, particularly by female scholars. This transformed when feminist theory, born out of the struggles for equality, began influencing academics including women taking on research roles within universities (Dumont, 1987; Perry & Rosemary, 2005; Hart, 2016). Consequently, this chapter will examine the theories integral to developing a discussion on the Romano-British female life course. At the core is the influence of feminist theory on the study of past populations through its vital role within the development of gender theory. After a brief discussion on the impact of feminist and gender theory, the subsequent section will use both theories to critique approaches used to discuss archaeological populations, particularly Romano-British archaeology. Following on from this is a discussion on the impact in the specific area of Romano-British archaeology and the dependency on the extensive breadth of sources, and their limitations, required to discuss women in Roman Britain.

The second section of the chapter shifts focus from feminist and gender theory to the life course perspective in which events and transitions are analysed to provide insight on a range of trends and issues for example, health or social mobility. One of the largest obstacles to overcome when applying the life course perspective to past populations is the concept of age and how some aspects of determining age or stage in the life course are culturally specific. Although initially the life course method developed within the field of sociology, the resulting methodology can form a lens in which to view past populations through a socio-historical approach. The last topic discussed is Romanization as the majority of literary sources on women are not from Britain but written by men living in and around Rome. It is therefore necessary to understand the ideas behind the cultural exchange. These theories will provide the framework for discussing the development and lives of women within the Romano-British period.

## 2.2 FEMINIST AND GENDER THEORY

Feminist theory takes into consideration an androcentric bias caused by predominately male scholars and patriarchal societies. Although the ideals behind feminism date back hundreds of years (Offen, 1988), even early female scholars avoided topics on gender and women (Foxhall, 2013). While academics traditionally divide feminist movements into three historical ‘waves’ the late 19th century, the 1960s and 70s, and finally the 1990s (Gilchrist, 1999), this does not

take into account an emerging neo-feminist movement that has recently formed as a reaction to traditional feminist theory. Heavily influenced by social media and technology in general (Baumgardner, 2011), this new fourth wave of feminism relies on forms of instant mass communication which allows for shared experiences that have assisted in creating a wider movement.

Feminist theory, particularly the second and third 'waves' of feminism and its application in archaeology, profoundly influenced the modern perception of gender theory. However, several key concepts remain muddled when transitioning between earlier works and current perceptions on sex and gender (Flax, 2013). Gender theory, unlike biological sex, focuses on the way society views its members (Butler, 1993; Gilchrist, 2007; Archer & Lloyd, 2002). A key component of gender theory revolves round the concept of 'gender identity', which consists of two philosophical branches. The first, classic personality approach, distinguishes communal from agentic traits or interests. The second, gender self-categorization approach, encompasses identification with the social category of women or men (Wood & Eagly, 2015), thus limiting it to a binary structure but easily aligning with biological definitions of sex. An additional benefit to using the self-categorization approach is that it allows individuals the flexibility to either habitually categorize themselves by gender or to adopt gender categories based on contextual factors (Wood & Eagly, 2015; Schmader & Block, 2015). As a 'social construct', gender roles then refer to the expectations or 'social norms' a society places on its members. Developed around division of labour and ideal characteristics within the society, gender norms are taught early in childhood, form the base of social groups and are often reinforced throughout the life course, albeit not always successfully (Tobin, et al., 2010; Halim, et al., 2011; Liben, 2014). Gender and the related 'social norms' are also culturally specific. They vary between cultures, geographic locations, time, and occur at different points within the life course, all of which interact with the universal framework provided by characteristics deemed masculine or feminine (Wood & Eagly, 2015).

Neither biological sex nor gender identity infers sexual orientation; however, the heteronormative approach used by scholars for much of the 19$^{th}$ and 20$^{th}$ century removes this from the discussion of women in many past populations. It is appropriate to comprehend both sexuality and gender as fluid, with the ability to shift throughout a person's life course and between social groups or cultures (Butler, 1999; Tobin, et al., 2010) and this must also be taken into consideration. Additionally, views are culturally specific as shown by the homoerotic relationships of Ancient Greece and Roman same-sex relationships based on the power of the penetrator over the penetrated (Corbeill, 2010). In Rome, for instance, there is no evidence to suggest that sexuality influenced a person's social standing aside when it fell outside of the

culturally accepted power hierarchy among men (Flemming, 2010). Many societies, including those in the Roman world, followed a binary system of male and female with limited exceptions such as eunuchs and the Gallic priests of Cybele (Stevenson, 1995). However, some scholars argue that because of the unique roles of eunuchs, Romans understood the fluidity of sexuality during the Late Republic (Skinner, 2014) but there is limited evidence of how this concept would have impacted women living in Roman Britain. Despite the possibility of a non-binary Roman system, gender roles affected division of labour, sexual relationships, leadership, daily life and treatment after death making them vital to any discussion on the life course of women.

## 2.3 Feminist Theory in Archaeology

Both the temperance and early suffragist movements profoundly shaped the first wave of feminism. By challenging the Victorian era "cult of domesticity" and the established patriarchal system in the mid-to-late 19th century, the movements brought to light the expectation for women to remain confined to the domestic sphere and the inequalities within society they faced on a regular basis (Jackson, n.d.). While the first wave of feminism focused on rights for women, particularly emancipation, it did not influence academics in the same way later feminist waves would.

Inspired by writings such as *The Feminine Mystique* (Friedan, 1963), the second wave of feminism emerged during the civil rights era of the 1960s and 1970s. Developing during a period of cultural turmoil allowed it to easily fall alongside the numerous other social movements at the time some of which, such as racial inequality, were deemed more pressing. It incorporated a range of issues important to women at the time including equal pay, birth control and sexual harassment. Additionally, it introduced the concept of *androgyny* within feminist theory, which allowed for the rejection of traditional gender roles and the related social norms (Scott, 1988). This was the first wave of feminism to influence the fields of archaeology, history and social sciences in general. As a result, there was an increased awareness of the lack of research conducted on topics important to women and of the male centric bias of previous scholars. Often when discussing a culture or society, academics viewed gender roles or sexuality from the male perspective making women the "other" and it was this viewpoint that scholars throughout the 1980s and early 90s attempted to shift away from (Flax, 2013). Developed in the 1990s, the third wave brought an increased awareness of the LGBT community and the inequality women still faced within the workplace (Evans, 1995; Whelehan, 1995). Recently, a fourth wave has begun focusing on a global perspective hoping to counteract sexism and inequality in the public sphere such as public transportation or bank notes (Cochrane, 2013a). However, it remains in the foundational stages with some debate

surrounding the movement qualifying as a fourth wave or simply a continuation of previous struggles (Cochrane, 2013b).

In archaeology, examining historical populations through feminist theory aims to not only understand gender in the past, but also specifically focus on female voices often missing from 'colonial' literature (van Dommelen, 2006; Versluys, 2014). The second wave of feminist theory influenced post-processual archaeology as it took into account how perspectives are shaped by social experiences- mainly the concepts of masculine and feminine. However, in the search for female voices, it is possible to overlook, dismiss, or even inaccurately reinterpret evidence by focusing on women and ignoring the wider context. This introduces a biased agenda, which is very different from increasing awareness of women in the past. Issues can also arise when modern gender stereotypes are placed into historical contexts, known as the gender paradigm (Gilchrist, 1999). Gender roles and stereotypes, like gender identity, are a separate construct from biological sex and vary by society. Early historians, archaeologists and anthropologists placed the values common within their own society on past populations through assumptions on division of work or the value placed on gender specific activities.

### *2.3.1 Gender Theory in Archaeology*

There is a great deal of debate surrounding the key concepts of gender. Heavily influenced by Foucault, one of the most influential proponents of a postmodern approach to sex and gender identity is Judith Butler (Hekman, 2005). She famously claims, "There is no gender identity behind the expressions of gender" because identity is based on performative acts which uphold and maintain binary constructions of gender identity (Butler, 1999, p. 33). Performative acts- with her example of a midwife saying, "It's a girl", binds gender to the body from birth. This forms the starting point for lifelong emphases on gender and gender identity. Additionally, these performative acts are crucial to the gender that a person identifies with and the gender they choose to present towards others in the world, both of which can remain fluid throughout the life course (Butler, 1993). This perspective creates historically and culturally specific concepts of male and female, which would be difficult to comprehend as an outsider.

As a response to Butler's theories, Flax (2013), who believes that the goal of feminist theory ought to be the analysis of gender relations, argues that a person can only be one gender never the 'other' or 'both', because gender is binary with only two types of persons created, male and female. Although, Butler's idea of fluidity provides a space for those outside heteronormative gender roles a place within the gender system, there are a number of issues with both viewpoints. For example, some cultures or societies utilize a system of two or more genders (Archer & Lloyd, 2002). As gender is a cultural construct, the perspectives of both Butler

(1993; 1999) and Flax (2013) fail to incorporate the varying concepts related to gender across populations. This is particularly poignant when an older child or an adult does not represent the gender assigned visually at birth or falls into an additional gender category accepted by the culture such as the *hijra* of Southern India and *two-spirits* of some Native American cultures (Gilchrist, 1999). When discussing social roles, identity and the life course it is important to understand the culturally specific attitude of social norms because social norms and self-categorization influence gender identity (Wood & Eagly, 2015). This is a fundamental concept when relating gender or gender identity to historical populations because it requires understanding that traditionally held or modern expressions of gender may not be accurate for past peoples.

Furthermore, Butler (1993) describes sex as a cultural construct, determining that both gender and sex can change through time. This outlook creates several issues when examining historical populations since some cultures separate biological sex from gender. Additionally, a key component of understanding past populations relies on osteological evidence which inherently depends on the concept of biological sex remaining fixed. As a result, it is preferred to use an idea put forth by Turner (1996) in regard to the social construction of gender. Turner asserts that when examining the life course, gender is a cultural or social construct while sex can refer to a separate biological definition. Going forward, it is appropriate to refer to gender as the way society may have viewed a person or how a person chose to present themselves, in respect to their gender, to the wider society. This is a limitation of osteological methodologies, which emphasizes biological sex, and as a result, it is fitting to use a range of evidence including historical texts, material culture, artwork and literature to examine gender in past societies (Sofaer, 2006).

Within archaeology, gender theory is closely related to the backlash against processual archaeology, which emphasised a scientific or functionalist approach (Hodder, 1992). Initially, the interpretation of gender in archaeology stemmed from the 'Man-the-hunter, Women-the-gatherer' model (Zihlman, 1998). However, this interpretation reflected the now outdated male/female dichotomy among western cultures of the early to mid- 20$^{th}$ century. This line of scholarship also perpetuated the exclusivity of gender roles and the assumption that roles are ridgid within all societies, which is often not the case. Lastly, it fails to consider the values placed on different types of 'work' by assigning a higher value to traditional male-oriented tasks (Conkey & Spector, 1984), such as hunting in comparison to childrearing or food production- roles viewed as traditionally female work. Issues surrounding the interpretation of work and its value also influence the interpretation of artefacts such as grave goods, a key source of information for many historical periods including Roman Britain.

#### *2.3.1.1 The Impact of Gender and Feminist Theory in Roman Archaeology*

Prior to the influence of feminism and gender theories in the fields of study which focus on the past such as archaeology and history, women were noticeably absent, often overlooked and remained as secondary agents when discussing past societies (Dixon, 2001; Foxhall, 2013; Gilchrist, 1999; Nelson, 2007). Early authors Guglielmo Ferrero (1911) and Jérôme Carcopino (1940), a pioneer of the "daily life" movement, attempted to link feminist issues of the day such as the freedom to participate in active roles outside of the domestic sphere with rights of women observed in the Roman period. Frustratingly, writers such as Carcopino (1940; 1960), who is still popular among undergraduate courses (Dixon, 2001), chose to adopt the viewpoint on Roman women similar to that of ancient authors. This attitude towards women is likely the result of his ability to identify with the elite male authors (see Robinson, 1947 for similar bias on women in Ancient Greece). Throughout the 19th and 20th centuries, women were prevented from expressing their own agency. This perspective allowed Carcopino (1940) to interpret ancient works as justification for the subordination of women during his lifetime by dividing Roman women into two groups. The first group described by Carcopino is the 'ideal' woman, one who is strong and virtuous; both are similar attributes to those described by 1st century AD philosopher Musonius Rufus (*The Study of Philosophy*, 4). Rufus states that an ideal Roman woman, and future wife, should be sensible, just, chaste and courageous. On the other hand, the second group Carcopino uses emphasises the 'unbridled' woman. In this group women are described as being disgraceful or selfish, who refuse to conform to social norms and whose actions lead to equality within the marriage as she attempts to assert herself. He claimed that the decline of socially acceptable gender roles, such as women remaining in the domestic sphere and limited in their own agency, would result in the downfall of family values and society as a whole (Carcopino, 1940; Foxhall, 2013). This division of women as into two opposing categories is outdated and Carcopino perpetuates the inappropriate idea that it is acceptable to interpret past cultures through modern perspectives.

Influenced by the second wave of feminism and in anattempt to rectify the situation of male-centric authors in Roman studies, scholars focused on 'finding' women and emphasised them occupying a separate context from the rest of society. However, research on women in Roman studies using the feminist perspective or incorporating gender theory remained limited and overlooked, until those educated during the second wave of feminism entered the field in the 1970s and 80s. As society began to gaze inwards, issues of socio-economic class pushed to the forefront of society. A similar shift occurred in Roman studies with Sarah Pomeroy's pioneering work 'Goddesses, Whores, Wives, and Slaves: Women in Classical Antiquity' (1975). In this work she examines a range of women regardless of their class or socio-economic level. This was the first publication to provide an excellent and rare account of slaves and

prostitutes alongside lower class and ‘working’ women. However, it failed to incorporate women into the wider society by typecasting women into specific groups (i.e. slaves, prostitutes). This removes them from the context of their lived experience in a multicultural and varied socio-economic environment. While the evidenced she uses in support of her theories on women is vast, she only briefly mentions childbirth or other gynocentric moments or events in the life course, despite these forming an integral role in the lives of women from all socio-economic, geographic or historical groups.

As authors examined the ancient world, they continued to do so from an androcentric viewpoint, the frequent default when discussing past societies (Alberti, 2006; Flemming, 2000). Due to the extensive range of topics covered by authors in academic works during the 1970s and 80s, women were viewed simply as characters in literature, or to be discussed in relation to laws or in context of the domestic sphere (Bush & McHugh, 1975; Harris, 1982; Lefkowitz, 1983; Saller & Shaw, 1984; Shaw, 1985; 1987). An issue with this approach stems from the grouping of all women into a single category or culture without taking into consideration stages in the life course, historical or cultural differentiations (Gilchrist, 2007), thus making them exclusive rather than inclusive (McDowell & Sharp, 1997). Additionally, this outlook detaches women from the world around them, allowing for misinterpretation of their relationship within wider society.

Influenced by the rise in LBGT awareness and gender inequality, the third wave of feminism began in the 1990s. In feminist and gender archaeology this period saw a split among theorists. The first group advocated poststructuralism or postmodern theories and the second preferring postcolonial theory (Foxhall, 2013). Among Roman archaeologists, the emphasis shifted from simply ‘finding’ forgotten women, to incorporating gender and sexuality into research about the roles of Roman women. This led to the popular ‘gendered spaces’ concept. Prevalent among Roman archaeologists (McDowell & Sharp, 1997) the landscape or layout of buildings, cities and other “spaces” are examined through the perspective of gender theory (Nelson, 2007). However, this approach remained exclusionary with men and women viewed as occupying different ‘spaces’ and women remaining closely linked to the domestic sphere (Allison, 2006; 2007). Additionally, academics of this period continued focusing on ‘elite’ women, who were not representative of the whole population (Fraschetti, 1999; Hemelrijk, 1999) but are heavily reflected in the material culture. These aristocratic women represent a tiny fraction of the female population and exercised power and influence above other social classes. This era also marked an increase in the analysis of burial sites, providing a new context in which to study women. Burial sites combined with modern gender theory to result in academics advocating gender hierarchies, which mirrored contemporary issues similar to their earlier counterparts.

However, separate burial practices including grave goods or personal adornment reflect gender hierarchies not inequalities that are being expressed throughout the life course (Gilchrist, 1999) and should be taken into consideration when interpreting material culture, particularly grave goods. It is the inclusive approach of Gilchrist (1998; 1999) when examining women, albeit in a range of historical periods, which leads to innovative work incorporating women within the wide social context. However, this is a relatively new concept in Roman archaeology and therefore, few academics of the 1990s approached Roman women with the same perspective.

As the popularity gender theory increased throughout archaeology and history, academics began to consider masculinity or what it means to be a 'male' with a similar approach used by feminist scholars when discussing topics on women. Scholars such as Lin Foxhall (1998) explored the ideas that men, by default, are those represented by academics and scholars when discussing a culture or society. Exploring a range of sources, many of which previously taken for granted, such as the use of a gender-based language became important gateways into interpreting or criticising gender and identity (Corbeill, 2010). Scholars such as Skogstrand (2011) and Carter (2009) argue, that because of an overemphasis on women the gender theory movement has overlooked men who remain in outdated stereotyped images, particularly in prehistory. This exposes the limitations of approaching gender as a dichotomy. However, there are aspects of the female life course including puberty and childbirth which are an inherently sex-based or gendered experience and ought to be treated as such. When taking this approach, it should be with the understanding that an individual with a biological sex of female. Therefore, individuals may potentially experience menarche and childbirth, while simultaneously living a different form of gendered experience. Additionally, this removes the expectation that all females, particularly in modern societies, are experiencing menstruation, pregnancy, childbirth or motherhood.

The impact of feminist theory in archaeology has been profound with 80% of output from archaeologists utilizing feminist theory has focused on women and increasing the awareness around them in the archaeological record (Conkey, 2003). However, Marshall (2008) suggests that feminist theory has made little impact on the field of archaeology because of constraints surrounding a binary gender system which prevents full inclusion of non-binary cultures. Recent topics in academia endeavour to concentrate on issues that are gender specific or accentuate disparities linked to age, sexuality, and socio-economic status (Gilchrist, 2007). This new scholarship also endeavours to incorporate new thoughts on ethnicity, identity and queerness (Barnett, 2012; Orizaga, 2013). In order to move away from the outdated approach used by the previously divided theorist groups of the 1990s, current archaeologists need to link studies of women into wider social and political context (Foxhall, 2013). As a result, Roman

gender studies have and will become more inclusive with ideas on masculinity and the core concepts of femininity being challenged, while simultaneously attempting to approach the topic of gender from multiple vantage points. Therefore, Roman archaeology should aim for widespread incorporation of gender and feminist theories and attempt to highlight the contributions of women within Roman society, and demonstrate the wide range of roles women were able to occupy (Brumfiel, 2006).

#### *2.3.1.2 Influences in Romano-British Archaeology*

Academics working on women in Roman Britain followed a similar, albeit slightly later, path. In Romano-British archaeology, the wider trends of exploring women as part of daily life were followed by viewing them as separate entities outside the aristocracy or domestic sphere. Work centred on women living in Roman-Britain began to emerge during the early 2000s with academics such as Dorothy Watts (2001; 2005), Lindsay Allason-Jones (2005), and Eve D'Ambra (2007). Originally published in 1989, *Women in Roman Britain* by Allason-Jones, served as a turning point in the study of Romano-British women. As the first publication of its kind, she was upfront about the lack of primary historical and archaeological evidence that is associated with gendered behaviour. She states that it is inappropriate to discuss Romano-British women as if they were all full citizens with the same cultural, religious or socio-economic background. Additionally, she argues the male-centric bias of previous scholars had been questionable when applied to Britain at best. Both issues continue to plague scholars of Romano-British women today. Her early work represented a return to the daily life approach but filtered through a new discussion centred on the life course. The main downfall to this approach is the separation of life events and transitions, which are removed, over-emphasized and detached from their context of the life course. This is a result of choosing to focus on 'daily life' such as domestic duties and religion, with an emphasis on Romanization and the power structure in which women lived instead of providing a cohesive understanding of how specific events influenced a woman's life.

Dorothy Watts (2001; 2005) attempted to overcome the lack of primary sources by incorporating funerary analysis and osteological evidence into her discussion on the relationship between males and females, along with the influences of Christianity on society. However, the results as presented are not adequately justified, particularly her conclusion that the polarized gender ratios found throughout the Romano-British cemeteries stem from a mix of Christianity and infanticide- as the highest proportions were among areas heavily occupied or influenced by Romans (Watts, 2005). A fundamental error in her interpretation of material culture is the assumption "that the living use things in the same way as the dead appear to… [which] is a very dangerous thing to do" (Cool, 2007, p. 400). Her highly disputed conclusions on Romanization

and infanticide develop through a poor foundation in gender theory (Aldhouse-Green, 2006) and an inappropriate manipulation of statistics (Cool, 2007). An example of issues with *Boudicca's Heirs: Women in Early Britain*, occurs when Watts claims, "Many girls were already married at 15" (Watts, 2005, p. 127), but acknowledges, "There is no literary or inscriptional evidence for wives as young as this in Britain" (2005, p. 83). However, she does not provide evidence to support her argument aside from inscriptions, which can be problematic when determining ages of marriage across a large geographic and varied social region.

Recent work on Roman women in Britain has moved away from the traditional gender theory view of 'finding' women instead focusing on wider topics such as migration (Leach, et al., 2010). What separates the gendered approach to Roman Britain from continental Roman studies is the upsurge in incorporating the body or objects to theorize on the health or identity (Eckardt, 2014; Allison, 2015) of Romano-British women. Through osteological methods and isotope analysis, the study of human remains dating from the Romano-British period has created a wide range of scholarship on health and disease while the addition of material culture allows for the exploration of concepts incorporating migration or ethnicity along with status (Leach, et al., 2010; 2009; Redfern, 2006). The popularity of bioarchaeological methods, including osteology and scientific studies, alongside material culture, stems from the lack of written evidence produced in Roman Britain on the daily lives of its inhabitants. This forms a division in the types of evidence that can be used to discuss women during the Roman period, with those living in Italy and particularly in Rome constructed from literary sources in conjunction with material culture while for Roman Britain the lack of literary sources has increased dependence on bioarchaeological methods.

### *2.3.2 The Impact of Gender and Feminist Theory in Bioarchaeology*

Biological anthropologists, osteologists and others in the fields which contribute to bioarchaeology routinely assign sex to human remains based on skeletal features; however, the transition from physical sexual characteristics to gendered role in society is not always clear. Due to this, bioarchaeology has taken longer to approach the questions between physically assigned sexual characteristics and socially constructed gender roles (Geller, 2008). The result has been debates regarding the acceptability of assigning gender roles based purely on skeletal sex (Larsen, 1998). Additionally, the ability to accurately assign sex based on skeletal markers varies across the life course. For example, post-menopausal women who have low levels of oestrogen can take on male skeletal characteristics (Walker, 1995) which further complicates assigning both a physical sex and the corresponding fluidity of socially constructed gender (Joyce, 2008). As with the general field of archaeology, bioarchaeology moved through similar phases of 'finding' women in the archaeological or anthropological record (Brumfiel, 2006;

Conkey & Spector, 1984). One of the more recent influences of gender, feminist and queer theory in the field is reflected in the growing awareness of non-binary individuals, including those who are born unisex which can leave traces on the skeleton. Although, there remains limited published discussions on this topic (Sørensen, 2004), including methods to identify these individuals within burial populations, the widening discussion displays a shift in thinking among those within the field. (Bearman, 2016; Jones, 2014; Kralick, 2018; Killgrove, 2019; Geller, 2005; Knudson & Stojanowski, 2008)

An additional influence of feminist, queer and gender theory in bioarchaeology is seen in the increasing number of scholars examining wider topics, such as examining sex-based differences in health (Roberts, et al., 1998). The queering of archaeology and anthropology has grown as a result of scholars advocating that current archaeological research remains limited by a binary approach which is exclusive of those individuals and societies which exist outside a binary system (Marshall, 2008). Taking a biomedical viewpoint as part of a biocultural approach combines a range of fields and disciplines to discuss pregnancy from a cultural perspective while incorporating potential medical complications (Geller, 2008; Agarwal & Glencross, 2011; Walsh, 2010; Pfeiffer, et al., 2014; Stone, 2016). This has led to a rise in female 'topics' such as breastfeeding (Woolridge, 1995), possible indicators of domestic violence (Novak, 2006; Stone, 2012) and obstetric hazards from a biocultural perspective (Chazaro & Kersey, 2005). The increase in studies focusing on the lives of women is also limited by gynocentric observations (Geller, 2009). Obstetrics has traditionally been noted as a dangerous event in the female life course, particularly from an evolutionary perspective. However, by limiting obstetrics hazards or complications without considering the wider impact of cultural norms including access to healthcare, nutrition and birthing practices limits the discussion on the complications women face during childbirth (Stone, 2016).

As a result of the emphasis on evolution and racial studies pelvimetry became a popular subject among academics during the 19$^{th}$ and 20$^{th}$ century (Geller, 2008). To overcome the outdated stereotypes, feminist perspectives are now incorporating birth stories into the biocultural narrative of childbirth, including medical practices (Hill-Karbowski, 2009; Chazaro & Kersey, 2005; Stone, 2016; Rodney & Mulligan, 2014). However, these are a recent development within the field (Davidson, 2015) as much of the work in bioarchaeology has focused on the fetus (Lewis, 2007; Halcrow, et al., 2018) and the mother-infant nexus (Rodney & Mulligan, 2014; Stone, 2016; Beaumont, et al., 2015; Gowland, 2015). Scholars such as Carroll (2018) have combined funerary studies, primary written sources and osteological evidence to explore the relationship between women, childbirth hazards and the fetus takes an interdisciplinary approach as suggested by Sofaer (2006). While this approach contributes significantly to

combining a range of sources to discuss women in the Roman Empire, including Britain, the osteological evidence focuses primarily on the health of infants and women without the obstetric aspects of birth hazards. Outside of Europe this approach has resulted in discussions on violence towards women or continues to portray woman and children as a single group (Martin & Tegtmeyer, 2017). This leaves space for more studies which discuss female health and complications faced throughout the life course.

### *2.3.3 Material Culture: Literary Evidence*

Objects provide the foundation of scholarly knowledge on past societies and are particularly valuable when literary sources are unavailable or unable to represent the society as a whole. Frequently scholars divide artefacts through typographical or seriation studies, which group objects by usage, design or date. However, approaching the interpretation of artefacts as patterns, either male or female, with numerous assumptions made regarding the roles of each within a given society, emphasises the social versus biological differences (Gilchrist, 1998). Material culture can be particularly complex because, unlike primary written sources the owner or author is often unknown (Sorensen, 2006). Objects such as spindle whorls, which are used to twist fibres into threads, are typically associated with female activities by archaeologists across geographic regions and historical periods. However, they can occur in places typically defined as "male" (Allison, 2006; Beaudry-Corbett & McCafferty, 2002; Hendon, 1997; Keith, 1998). The resulting interpretation varies from old men and young boys assuming female duties in an all-male environment such as a military camp to evidence of women living or working within the traditionally male spaces (Hill, 2001). Essentially, it would be inappropriate to assume there is a direct link between objects and identity simply because that object is associated with a specific category of people, i.e. women, children, soldiers, or migrants, as it is all far more complex (Eckardt, 2014).

Ancient historians, classicists and archaeologists, depend on primary literature to provide a gateway into understand life in antiquity. However, interpreting literary sources does come with a set of limitations that need to be addressed surrounding translation issues and separation of Rome from other geographical areas. According to Hodder (2012) literary sources include a range of primary source material that fall into two categories: records (censuses, contracts, legal documents) and documents (letters, diaries). Literary sources are routinely used to provide information on political, economic and social context (Parker, 2000) but much of the literature on Roman customs dates from the Roman Republic (509 BC to 27 BC) and early years of the Roman Empire (1$^{st}$ century AD). It is, therefore, necessary to consider differences between people living in Italy and those living in Roman Britain (43 AD to 409 AD) when interpreting primary sources. Although falling outside of Hodder's classifications, the written works such

as Cicero, Vergil and Horace, survive due to transmission of the ancient works by monks during the early Middle Ages (Clark, 2011). Transmission means the reinterpreting, editing and copying by those living in monasteries, well after the authors originally penned the works. For academics looking to examine gender or ideas of identity, literary sources can be difficult to rely upon as historians during the 19th and 20th century often used historical interpretations as justification for the subordination of women within their own society (Flemming, 2000). It is far more objective to use primary written sources, which are not pieces of literature but actual legal documents, letters, or diaries that would have undergone little later selection. To overcome the bias created by interpreting objects or literary works as reflections of life, which are often categorized as masculine or feminine, all interpretations of the female life course from such sources should be culturally specific and consider changes occurring over time or geographic location.

### *2.3.4 Material Culture: Burials, Human Remains and Grave Goods*

Burials and the associated remains and grave goods provide a source of evidence linked to an individual, which is particularly important when examining gender identities. Since second wave feminism, archaeologists have concentrated on "engendering" the past (Arnold, 2006) through a variety of sources including grave goods and human remains, which according to Sofaer (2006) are also relevant examples of material culture. Ardren (2002, p. 4) states, "When archaeologists examine human burials, we see how the dominant culture, in the form of surviving family members, wanted an individual to be remembered or portrayed in death, but we also get a glimpse of how the deceased wanted to express his or her gendered identity in death." As Williams (1999) points out, such views can severely restrict understanding of the significance- socially and culturally, of funerals and burial places. Moreover, in situations where multiple and possibly conflicting, ideologies coexisted, burial sites can emphasise the differences between groups or allow separate cultural groups to come together through shared ritual practices and burial sites. In a strongly stratified society, burials allow for an intermixing between those with wealth and/or authority with people who may have a different ethnic or religious background (Williams, 2002). In Roman Britain, a range of cultural groups existed particularly in urban areas; therefore, the gendered identity of an individual in death reflects a range of customs.

Conkey and Spector (1984) also argue that it is possible to make inferences on gender roles based on material culture patterning citing Gibbs (1998) as an example of a successful study. Gibbs (1998) analysed both patterns in material culture associated with gender and the visibility of women because she applied gender differentiations in grave goods to social roles. However, in death, it is often the "ideal" which is portrayed. An issue with relying on objects to develop

an understanding of gender or gender-specific topics stems from the lack of clarity regarding usage or ownership before death (Nelson, 2007). As the "dead cannot not bury themselves" (Derevenski, 1997, p. 1), grave goods alone do not necessary accurately represent the person in life (Nelson, 2007) and may not show any differences between males and females (Hamlin, 2007). Additionally, Allison (2015) argues that using material culture to discuss gender is difficult without strong evidence and specifically mentions perfume bottles and sewing needles which are traditionally associated with women despite scholars being aware that men also practiced extensive grooming habits and sewing needles were found along Hadrian's Wall, an area associated with male Roman soldiers. By incorporating osteology, which provides evidence of biological sex, and thus avoiding an exclusive reliance on grave goods to categorize burials by gender, we can allow sex and gender to come together in order to examine the life course.

When examining the female life course, it is necessary to incorporate key concepts of gender theory and understand the limitations on assigning objects, spaces or duties masculine versus feminine identities. While grave goods can be associated with a specific burial and the sex of the individual potentially determined, they do not provide evidence of usage or ownership during the individual's life.

## 2.4 Life course Perspective

Popularized in the 1960s, the term *life course* is adapted from modern sociology and refers to "the study of biography, of history and of the problems of their intersection within social structure" (Mills, 1959, p. 149). The aim of studying the life course is to gain an understanding of how development and ageing within different historical and geographical contexts affects a person's life (Elder, et al., 2006), focusing on the cultural aspects of an individual's maturation. This term is different from *lifecycle*, which emphasises the biological development of an individual, not the social aspects that parallel their physical maturation and are culturally specific. Early examples of the life course approach centred on intergenerational relationships within the family cycle with children maturing, marrying and becoming parents, thus starting the cycle again (Glick, 1947; Hill, 1970).

### *2.4.1 Life events and transitions*

Thorton (2005) argues against using "developmentalism", which focuses on stages of life and transition through stages of life as an approach to examining the life course. This is due to negative connotations surrounding labelling stemming from cultural hierarchies and a lack of cultural relativism, such as determining when an individual reached 'adulthood' or age of consent; however, when discussing historical populations, it is necessary to group people and

events as a way to compare and contrast societies through examining trajectories of life events and transitions (Elder, 1980). Life events refer to an event such as the death of a parent or a natural disaster, which causes an abrupt change and produce serious and long-lasting effects (Settersten, 2003). Life transitions such as puberty or marriage focus on transitions between life stages and represent a distinct change in an individual's role or status (Hutchinson, 2010). It becomes complicated as points of an individual's life course, such as marriage or pregnancy, can be considered both life events and transitions because the event produces long-lasting effects and is accompanied by a change in social status or new role. Trajectories are simply a chronological way to refer to the events and transitions throughout an individual's life (Elder Jr., 1998). This makes the life course gendered due to the different life events and transitions each sex passes through (i.e. pregnancy for females) along with being a social construct and culturally specific, with life events and transitions varying between geographic locations and periods. It is possible to view some aspects of an individual's trajectory through examining their remains (puberty, severe illness or injury) while other aspects are not (marriage or education). That is why it is necessary to approach the Roman life course from a variety of perspectives.

### *2.4.2 Cohorts and the Longitudinal Approach*

The "longitudinal" approach is a key factor in studying the life course as it relies on cohorts to examine culturally specific social changes through a set sequence of events that take place at the same age (Elder Jr., 1998; Volkart, 1951). Influenced by its position in time each cohort has a unique set of experiences (Ryder, 1965), caused by events such as war, famine, or cultural movements. Modern longitudinal studies collect information on developmental patterns of children, with many continuing into adulthood. This allows researchers to collect information on further education, marriage patterns, parenthood and work habits. The impact of these studies led to an understanding that the developmental process did not end in childhood but continued throughout the adult years (Elder, et al., 2006). Additionally, researchers could examine how specific events or cultural changes affected the life course, such as the Great Depression (Elder, 1999).

In archaeology, bioarchaeologists are unable to conduct longitudinal studies and must rely on broad cohorts to understand demographic information such as life expectancy or mortality rates based on age and sex (Pinhasi & Stock, 2011). There are a number of limitations to this approach and attempting to examine the life course of a historical population through cohorts in the traditional sociological sense can prove problematic because central aspects of demographic information such as age at first marriage are incredibly varied when spread across an entire population (Shanahan, 2000). For example, Britain lacks a consistent record of life events or transitions for the majority of the population until the medieval period with parish records

documenting certain life events such as births, marriages and deaths (Saller & Shaw, 1984). Furthermore, the longitudinal approach does not take into consideration an individual's physical development and can prove problematic when used in societies that do not rely on chronological ageing systems. Research can overcome methodological issues inherent in cohort studies when analysing archaeological populations by focusing on the *longue durée* or long-term trends and social groups (Harlow & Laurence, 2002; Gilchrist, 2000; Pudsey, 2016). This method is particularly useful when discussing Roman Britain, which spanned over 4 centuries due to the difficulty of connecting vast numbers of remains to specific events such as wars or short periods of poor harvests. In lieu of highlighting specific events or focusing on individual remains, as with osteobiographies, it allows for an emphasis on long-term development, specifically development that can be linked to changes in expected social norms such as marriage or motherhood (Gilchrist, 2007).

### *2.4.3 A Socio-Historical Approach*

A socio-historical based approach, developed in the 1980s, provided the general context that allowed life course studies to be placed into wider human history (Kuh, et al., 2003) by combing literary and archaeological sources from a specific cultural period with sociological methods previously used to understand the movement through different stages of life. The rise in life course theory, as it related to historical populations, paralleled an increased interest in women, social classes, and urban versus rural societies (Elder Jr., 1998), which attempted to connect present-day cultural norms or socio-economic situations with past generations. Recent trends in life course literature have focused on health and ageing, using human remains to develop an understanding of maturation and diseases (Mayer, 2009; Roberts & Cox, 2003), which do not require modern perceptions to be placed on historical populations.

## 2.5 AGEING

There are four types of ages which need to be addressed when discussing development: biological age, which focuses on physical maturation, chronological age or years since birth, social age based on key social events or transitions, and finally psychological age which deals with maturity and awareness (Hutchinson, 2010; Settersten Jr. & Mayer, 1997; Hagestad, 1991). A key aspect of the life course involves recognising how different individuals within a given population or society develop and move through various life events and transitions as maturation and development is different for everyone. This becomes problematic when relying on chronological age, which fails to consider an individual's biological or social age. Osteologists rely on biological age to determine the stage within the life cycle an individual has reached based on the level of maturation or degeneration. Once assessed, individuals are often assigned a chronological age based on their biological age even though males and females move

through the life course at different chronologies. Lastly, individuals are grouped into stages or categories, such as adolescent, young adult or mature adult. These groupings, which lack a consistent definition across studies, reflect the social age of an individual and can lead to problems when comparing different populations (Falys & Lewis, 2011; Sofaer, 2006). In order to develop a robust methodological framework, it is imperative to incorporate multiple forms of ageing to determine an individual's level of physical, biological and psychological maturity within a society (Gowland, 2006).

### *2.5.1 Biological Age*

Biological age represents an individual's own maturation in regard to their potential life span. Osteologists rely on biological age to determine the stage within the life cycle an individual has reached based on the level of maturation or degeneration. Since humans typically follow the same life cycle, it is possible to link biological age across cultures (Settersten Jr. & Mayer, 1997). However, perceptions of age are culturally specific and studies suggest different genders attach distinctive social aspects to ageing due to gender specific life events such as menarche or motherhood (Hagestad, 1991). This makes biological age difficult to use without historical context in archaeological populations.

### *2.5.2 Chronological Age*

Chronological age relies on a calendar-based system for determining age and lacks cross-cultural understanding (Halcrow & Tayles, 2008). Among non-industrialized societies, including both historical populations and modern groups such as the !Kung Bushmen, studies show there is little conceptualization of chronological age (Settersten Jr. & Mayer, 1997). This makes it very challenging to entirely understand how people of a specific culture, particularly historical or archaeological populations viewed or relied upon age in terms of years. Lastly, chronological age also fails to incorporate any reference to social development an essential aspect to understanding the life course.

### *2.5.3 Social Age*

Social age is culturally specific and refers to behaviours expected by a society at various stages in the life course. These expectations or "age norms" can be either informal or formal (Settersten, 2003). Informal "age norms" vary from individual to individual but are reinforced by society as a whole, such as age limits on women giving birth (Billari, et al., 2010) or the age at which a child is weaned. Formal age norms, such as the ability to drive or vote, reinforce age structuring, with a specific age representing a transition from one stage to another and encompass the entire society. Both formal and informal norms vary throughout history, over geographic regions, and by social class, gender and religion often simultaneously (Hutchinson,

2010). However, when combined with other sources such as laws or funerary monuments, it is possible to use social age to understand the expectations within a specific culture on an individual as they move through different aspects of their physical development determined by their biological age.

### *2.5.4 Psychological Age*

Psychological age often referred to as maturity, focuses on the skills and ability to adapt to changes in biological or environmental demands. Unlike other ageing methods, it emphasizes the age which people perceive themselves to be (Hutchinson, 2010). While extremely important to understanding the life course of an individual, it is impossible to determine from osteological evidence. However, an individual's level of maturity is often reflected in primary written sources such as journals or personal correspondence.

### *2.5.5 Literary Sources and Ageing Approaches*

Many past societies including the Greeks and Romans relied upon biological and social age in place of chronological age. Julius Paulus, an influential Roman jurist during the 3rd century C.E., wrote a commentary on eligibility for betrothal. He felt the law allowed for those who had not reached puberty to enter into a betrothal legally. The opinion lacks a reference to specific chronological ages, instead, depending on a biological reference for maturation. In addition, he wrote that marriage required anyone under the power of his or her father (*patria potestas*) to seek out permission prior to a betrothal becoming legal (*Opinions, Book II*). Since a father or other guardian would have decided when the child was mature enough for marriage, this is an example of a culturally specific social age. This is often the case in historical populations making it necessary to combine multiple ageing approaches. However, written records such as this law treaty are not without their own shortcomings.

Literary sources are often used to provide information on the political, economic and social context in which different ages can be interpreted, i.e. the social expectations of an individual vary by economic status and throughout the life course. When used in conjunction with osteological methods to discuss the life course of a given population literary sources can create a flawed perspective. In historical populations, they often only represent males and frequently dismiss lower classes. In general, literary sources reflect only a small portion of a diverse society. As a result, when used to determine social or psychological age, literary sources need contextual support and validation thus considering any bias on the part of the author.

## 2.6 Roman Influence in Britain

The concept of *Romanization* refers to the level of interaction between "Roman" culture and "Native" culture and dates from the era of Victorian scholarship in Britain (Haverfield, 1923). Although outdated, the traditional view of Romanization focuses on the superiority of Roman culture. In Britain, the dissemination of Roman culture happened through interactions with "Native" cultures as Roman armies expanded Rome's sphere of influence. Aside from the traditional view, there are five main schools of thought or models used to discuss the spread of "Roman" culture.

- **Non-Interventionist**, where Native elites desired to increase their social standing through adopting Roman customs (Millet, 1990b).
- **Acculturation**, which allows for specific aspects of each culture to merge into a new single culture (Webster, 1997).
- **Creolization**, where two or more cultures integrate to produce a new blended culture (Webster, 2001).
- **Discrepant Identity**, which supports the idea of no unilateral form of Roman identity since most "Romans" in Britain were born abroad (Mattingly, 2004).
- **Globalisation**, which focuses on the increase in the flow of objects, people and ideas to create translocal perspective on daily life (Pitts & Versluys, 2014).

In viewing Romans in Britain through the lens of post-colonial theory, it is likely that Roman culture influenced those living in Britain in a variety of ways and was in turn influenced by local cultures. The make-up of the Roman army supports the discrepant identity theory as there is evidence for soldiers coming to Britain from as far away as Africa (Swan, 1992). It is important to remember that the Roman Empire by the 1st century CE was formed from many different cultures; there was no single "Roman" way (Hill, 2001).

Some scholars such as Millet (1990a, p. 1) argue, "We must thus see Romanization as a process of dialectical change, rather than the influence of one 'pure' culture upon others. Roman culture interacted with native cultures to produce the synthesis that we call Romanized". This argument gives equal weight to both the native and the Roman culture or two-way acculturation; however, in places such as Britain where the Roman presence was primarily military other scholars feel this does not accurately explain the interaction between Roman and native culture (Murray, 1991). Hill (2001) suggested it is necessary to consider the region, gender, age, sub-group and class in order to determine a person's identity. However, the concept of an equal exchange of ideas is not supported by post-colonial theory as it does not take into consideration the hierarchy of colonizer over the colonized (Said, 1993).

Millet (1990a) suggests women played an important role in the cultural exchange process. Roman soldiers formed relationships with native women, as evidenced by written sources and archaeological finds, which allowed native women to take on Roman ways of life or aspects of Roman culture (Saller & Shaw, 1984). However, this does not take into account how women living in Britain viewed themselves and represents only a small fraction of the overall female population who could afford tombstones or imported items (Allason-Jones, 2005). The difficulty with determining the extent to which inter-marriage influenced native cultures stems from a variety of factors. Each tribe within Britain had a slightly different set of traditions that would have influenced her own cultural perspective, taking into consideration her family identity, role within her native community and different geographical variations such as food preferences. Women in Britain potentially married husbands from throughout the Roman Empire and often these men were from previously 'conquered' tribes themselves. Therefore, their husband had already interpreted the Roman way of life through the lens of his own cultural exchange and effects of colonialization. Lastly, while native women may have taken on Roman ways of living, within the individual household it is impossible to determine the extent to which their own native traditions influenced daily life, particularly oral traditions which are not evident within the archaeological record.

Funerary practices and burials can also reflect a change in cultural patterns through time as the influence of Romans reached Britain in the 1st through to the 5th centuries. Objects, including grave goods, can show patterns of consumption and evidence of trade while reflecting personal taste. Skeletal studies have shown that the Roman influence in Britain had varying degrees of intensity over the four centuries known as 'Roman Britain' (Redfern & DeWitte, 2011). As generations passed, the concept of Roman and native culture in Britain blurred since the Romans borrowed from other cultures this created new and diverse traditions (Barrett, 1997). However, this does not provide evidence for the extent to which laws and other non-material culture related traditions influenced Roman Britain as the literary evidence for women in Britain is negligible (Allason-Jones, 2005). There are a number of questions on Romanization that relate to identity, which benefit from a throughout investigating of funerary or burial practices alongside osteological examination of female remains such as the research conducted on 'The Ivory Bangle Lady' (Leach, et al., 2010). Interdisciplinary investigations have the ability to examine all aspects of a women's life including the potential influence of Roman culture on the Romano-British populations.

## 2.7 CONCLUSION

Although a far more popular topic than in previous generations, few scholars discussing Romano-British women have a deep understanding of how to combine feminist and gender theory along with a life course approach until the 3rd wave of feminism. Instead, many scholars emphasized the daily life approach which covers a range of topics such as religion and the law. However, this approach leaves women in the domestic sphere allowing only a select few, often elite or religious women, an active role in the public sphere. By limiting the influence of women from the start, it becomes impossible to create an accurate perspective on women in past populations and dismisses any forms of agency women many have exerted. To overcome this issue, along with the inherent bias produced by androcentric evidence and previous scholarship, feminist theory attempts to acknowledge the dilemma in studying populations without perpetuating the gender paradigm.

A key aim of this work is to bring together bioarchaeology and concepts of gender through a discussion of available material culture and literary sources that is then applied to the Romano-British female life course. Gender theory suggests there are inherent differences between genders based on factors that influence identity including ethnicity, age, sexuality, and status. However, evidence from Roman Britain is different from the wide corpus of sources on those living within the ancient city of Rome. When discussing women living in Roman Britain this body of evidence dwindles further. Therefore, it is necessary to take a socio-historical approach and incorporate a wide range of material culture and evidence including literary works, objects, and human remains.

When used from an anthropological perspective the life course approach requires the understanding of different ways populations approach ageing. In this case combining social and biological age allows for the creation of culturally specific age categories alongside the ability to focus on the *longue durée* (Harlow & Laurence, 2002; Gilchrist, 2000). As the Romano-British period spanned over four centuries, it is most appropriate to focus on long-term treads and interactions between social groups in lieu of specific cohorts based on a year group common in early sociology-based life course studies. By removing the dependency on specific chronological ages and exploring development linked to changes in culturally specific expected social norms such as marriage or motherhood which occur after physical changes connected with puberty, the cultural or social age categories that emerge are is directly associated with gender (Gilchrist, 2007). Additionally, the use of human remains allows a slightly modified longitudinal approach to be undertaken, since it is impossible to follow the same set of individuals throughout their entire life course. However, it is feasible to examine a group of

individuals either living in the same region but from different periods of time and stages in the life course or to compare those in similar stages of the life course across geographical regions to gain insight into life events and transitions. This work will rely on the latter approach towards investigating life events and transitions of Romano-British women focusing on puberty and childbirth.

It is essential to understand the theories surrounding Romanization in order to combine sources from Rome and elsewhere within the Roman Empire. Recognising the ways in which Romans influenced and intermingled with native populations is crucial to applying the classical written works of Rome to conversations on women of Roman Britain. As previously discussed, there are several limitations to overcome in order to understand the lives of women when the written sources are scarce, date from previous centuries or written thousands of kilometres away. To surmount these limitations, it is fitting to take on an interdisciplinary approach to the topic by bringing together literary material, artefacts and objects, along with an in-depth osteological analysis of human remains.

# 3 THE GENDERED ROMAN LIFE COURSE

The cultural constructions of wealth and status affected the female life course. Therefore, each stage in the life course should be examined both socially and biologically; however, this has not always been the case when discussing the Roman female life course. A range of sources are required, both historical and archaeological, due to the lack of female authorship in the Roman period and the underrepresentation of lower classes, the provinces, and children. This section not only discusses current work on Roman women, it examines their lives in Rome and Roman Britain. Through an in-depth analysis of key life transitions and events, which refer to the expectations which society placed on women in their respective social class, place in biological or social development and geographic location; however, these expectations shifted and evolved throughout the life course.

## 3.1 STATUS OF ROMAN WOMEN

The daily life and life course of a Roman woman was defined by her social and economic status. However, what remained constant was her dependency on men, a common occurrence in patriarchal societies. The status of women under the law perpetuated the custom of viewing women as submissive beings who were unable to manage their own affairs and who therefore needed a guardian. During childhood, this was the *paterfamilias* or the oldest living male relative, such as their father or uncle. Once married, the *paterfamilias* relinquished control over the girl as the husband replaced him (Gaius, *Institutes* 1.144-5). Guardianship was a fundamental aspect of Roman society and those who abused their power or took advantage of a female while serving as their guardian faced deportation or the loss of property as a consequence (Justinian, *Codex* 9.10.1L). However, older women were able to control many aspects of their own affairs and the *paterfamilias* often became more of a formality in some households (Gaius, *Institutes* 190-1). It is unknown to what extent the concept of Roman guardianship was used in Roman Britain aside from aspects of life, such as those written in laws, which were directly tied to Rome.

Additionally, women were unable to represent themselves in court and consistantly viewed as incapable of sound judgement according to the law. This limited their ability to act in their own best interest placed them in a subordinate position with limited agency. Female crime victims or females accused of committing a crime were represented by their *paterfamilias* who many not have always agreed with the woman. These limitations within the court system left women vulnerable to abuse and mistreatment by family members and the public. Women were unable to sign contracts and rarely able to own property which again limited their ability to make important life decisions even in adulthood. This creates issues when using Roman law as

evidence of the status of women in Roman society. It is problematic because it is geared towards a small percentage of the population, particularly wealthy urban women living near Rome who were able to exercise independence. However, many Romans lived in the countryside where the entire family worked as subsistence farmers, not in an urban environment. Epigraphs show women working in the fields picking crops alongside other workers and it is highly likely that when a husband was away conducting business that a wife would be left to manage the family farm despite being unable to legally conduct business transactions without her husband's or *paterfamilias* approval. Each province of the Roman Empire had a local legal code derived from Roman law and local customs (Allason-Jones, 2005). As a result, the treatment of women in the various Roman law codes such as *Lex Iulia* provide a glimpse into ways women from Rome and its vicinity were treated, it does not necessarily provide an accurate view of women in other parts of the Empire including Roman Britain. However, it can serve as general evidence of attitudes in a patriarchal society towards women who struggled with independence regardless of their social or economic status.

## 3.2 Roman Concept of Ageing

As a cultural construct, throughout the Roman Empire the concept of ageing and stages in the life course varied due to the influence of gender, wealth, status and geographical location. Ageing and the division of the life course into separate categories affects all aspects of a person's life ranging from marriage to social standing. It is vital to refrain from placing modern perceptions of ageing on past populations, including the Roman period, which do not always follow traditional "western" norms (Gowland, 2001).

A number of writers from the 1st-4th centuries discussed the stages of development, some based on maturity and others on specific numbers thought to be "magical" or superstitious (Table 1). In Classical Rome, Horace (*Ars Poetica* 156-8), wrote on the stages of development based on a variety of physical maturation indicators such as being able to grow a beard as a visual representation of manhood. He further notes the differences in psychological development among children, who are temperamental and impulsive, and adults who are able to control their emotions or desires (Harlow & Laurence, 2002; Rawson, 2003). Cicero (*Pro Cael*. 17, 41) describes individuals who are physically developing early puberty markers as unable to control their temperament or desires, coupled with the inability to focus on the future those in this stage of development often fall or "slip" into temptation. This is similar to Ptolemy's 3rd stage (*Seven Stages of Man*) where an individual enters into a stage of unbridled sexuality and frequent errors of judgement. Unfortunately, authors often focus on male attributes to describe the changes observed in maturation which again dismisses the female influence or importance across the life course.

*Table 1. Breakdown of stages within the life course throughout the Roman period according to ancient authors.*

| Stages | Horace | Varro | Livy (1.43) | Ptolemy |
|---|---|---|---|---|
| **Infancy** | Childhood (unknown age) | *Puer* (0-15yrs) | | Growth (0-4yrs) |
| **Childhood** | | | | Reasoning (4-14yrs) |
| **Adolescents** | Youth | *Adulescens* (15-30yrs) | *Adulscentia* (unknown age) | Reckless Youth (14-22yrs) |
| **Adult I** | Adulthood | | *Juniores* (<30yrs) | |
| **Adult II** | | *Iuuenis* (30-45yrs) | | Glory and War (22-41yrs) |
| **Adult III** | | *Senior* (45-60yrs) | | Past Prime (41-56yrs) |
| **Adult IV** | Old Age | *Senex* (60+ yrs) | *Seniores* (46+ yrs) | Adviser (56-68yrs) |
| **Adult V** | | | | Decline (68+yrs) |

## 3.3 Early Years

The health and treatment of infants, particularly when discussing Roman women, is of vital importance. Not only does it show the link between parent, the society and the infant, but it also reflects the overall health and wellbeing of the mothers (Lewis, 2007). All Romans, both mothers and fathers, felt it was the duty of adults to help shape a child's identity. Parents understood the importance of finding the best caregivers possible for their children during the early years since it is a period of tremendous learning and development (McWilliam, 2013). Therefore, the childhood of women in Rome and Roman Britain varied greatly based on their class or economic situation. Infanticide was once thought to have been common throughout the Empire (Harris, 1982); additionally, based on written historical sources scholars argue a gender preference for boys influenced the survival rates of female newborns (Harris, 1994). However, claims regarding infanticide are unsubstantiated (Millett & Gowland, 2015) and studies on infant remains are unable to support the theory of gender-based infanticide including DNA analysis of infant remains from provinces such as Judea and Britannia (Engels, 1980; Gowland, et al., 2014).

From birth a Roman infant was gendered and its role within society was beginning to form early on. After birth a midwife cut the umbilical cord and the infant was washed, then handed to the mother away from the father (Dasen, 2010). As only the father, or male representative of the family could formally acknowledge an infant into the family, alternative arrangements were required in cases where the paternity was in question or the father passed prior to the child being born. Under laws passed by Diocletian, in these situations the mother would give birth with representatives of both families present and the umbilical cord remained uncut until both families had viewed the newborn. This protected the child's rights as a future member of the family including inheritance rights (Dasen, 2010).

The father had until the child was one-month-old to provide a name for the official register; this was celebrated with a ceremony known as the *lustratio* held on the 8th day for female infants if the child qualified for citizenship (Rawson, 1992). During the ceremony, an augur foretold the child's future with bird entrails. The ceremony also served as an opportunity for the father or guardian to register the infant. At the conclusion of the ceremony, girls were given the female version of their father's name and a number relating to their birth order. Sisters had the same name followed by I, II or Eldest and Younger (Harlow & Laurence, 2002) to represent their birth order among the other sisters, living or dead. This is an example of how females were viewed within the patriarchal Roman society. An individual name represents a person's identity and by simply numbering all female children in succession, it was a way to track lineage, reinforce male dominance and the concept of *patria potestas*. Until the completion of the ceremony, an infant, male or female, could be refused acknowledgement for a variety of reasons including sex, illegitimacy, or physical deformities. If the child remained unacknowledged the family would not face any penalties or responsibility under the law (Dasen, 2010). It was only after this ceremony that parents received benefits from the state under the *Lex Iulia et Papia* and *Lex Iulia de Maritandis Ordinibus* in which women who had 3 or 4 children, depending upon their status, were no longer required by law to have a legal guardian. Under Roman customs, infants were unable to attain true personhood until they were able to walk and talk at approximately 2 years of age (Booth, et al., 2010), a change that may be reflected in burial patterns in expressing itself.

### *3.3.1 Infant Health*

Often born at home, young infants were highly susceptible to disease. Although exact figures vary by site, in Ancient Rome up to 30% of newborns died during the first days of life (Garnsey, 1993; Harlow & Laurence, 2002) and between 25%-35% before reaching their first birthday (Gowland, 2001). Whilst the exact rate of death among infants in Roman Britain must have varied over the centuries, there are a number of theories on the reasons for high death

rates. Once the midwife severed the umbilical cord, she washed the newborn in a warm bath. Next came the process of swaddling the newborn, which was quite complex and lasted until the newborn was two months old.

*"One must mould every part according to its natural shape, if something has been twisted during the time of delivery, one must correct it and bring it into its natural shape… The midwife should put the newborn down on her lap which has been covered entirely with wool or a piece of cloth…she must then take soft woollen bandages which are clean… some three fingers in breadth, others four fingers. The midwife then should take the end of the bandage, put it over its hand and, winding it around, carry it over the extended fingers; then over the middle of the hand, the forearm and the upper arm, slightly compressing the parts at the wrist but keeping the rest up to the armpit loose."* (Soranus, *Gynaecology* 2.14, 2.15)

The swaddling process continued to the other arm, then towards the upper trunk of the body where Soranus recommended, "In females binding the parts at the breasts more tightly, yet keeping the region of the loins loose, for in women this form is more becoming" (Soranus, *Gynaecology*, 2.15). Once the newborn is covered in bandages Soranus advises the midwife to "lay the arms along the sides and the feet one against the other, and with a broad bandage she should wrap up the whole infant circularly from the thorax to the feet" (Soranus, *Gynaecology*, 2.15) rendering the infant immobile. Understanding the influence swaddling would have on the newborn, Soranus advises against confining the joints for a long period to avoid thickening of the sinews since it can lead to ankyloses. The lack of mobility caused Pliny to relate the swaddling cloth to chains that shackled the infant from birth (Pliny, *Natural History*, 7.3) which reflected the first attempts by parents or caregivers to influence the shape of the child, mentally and physically (McWilliam, 2013). The act of swaddling had a negative impact on the overall health of the newborn by making it vulnerable to diseases including contributing to cases of rickets (Lewis, 2010) and could lead to death.

Another common theory is that the high rate of infant mortality is an effect of early weaning, resulting in nutritionally deficient diets for the infant (Lewis, 2010; 2009) or exposure to lead from contaminated water (Farwell & Molleson, 1993). However, isotopic analysis of infants and children from Roman Britain show that in infants between 0 and 1.5 years at death the carbon values are within the standard deviation of adult females, showing signs of continued breastfeeding. It is only among children aged 2-4 years at death that the carbon values change to show evidence of a shift in diet from breast milk to "soft foods" such as rice, oats and fruit (Fuller, et al., 2005). Although Soranus (*Gynaecology*, 1.16-1.17) advised women to avoid early weaning, the early adoption of Christianity, which advocated mothers fasting after birth, may

have resulted in poor maternal health. Early weaning risked denying the infant important nutrients as evidenced by high rates of infants with rickets or cribra orbitalia (Lewis, 2009). Soranus also recommended gradually increasing solid foods during the second year of life to prevent the infant from becoming ill and supply a wider range of nutrients than those provided in breast milk, particularly if the mother was lacking in essential nutrients herself (Soranus, *Gynaecology* 2.46-8). Soranus notes other writers advocate early weaning from 6 months of age and infants around Rome show evidence of being fully weaned by 18 months. In Roman Britain, similar isotopic studies suggest that weaning began at an early age but continued until the child was four (Carroll, 2018). A recent study examining the overall health of infants in the Romano-British period determined that a range of infections, trauma, and metabolic diseases resulted in the deaths of newborns, infants and children under the age of 5 years (Rohnbogner, 2015). Therefore, it is unlikely that early weaning was the primary cause of death among infants in Roman Britain. Although early weaning could have reduced the immune systems of young children leaving them more susceptible to other diseases and malnutrition.

### *3.3.2 Infant Burial Record*

Within the Romano-British archaeological record, burial practices reflected the social shift associated with weaning. Pliny provides three groups in which infants fall into at time of death which reflect the way society viewed infants as they progressed through their first years (Pliny, *Natural History* 7.15). The first group consists of newborns without teeth, followed by infants who, at around 6$^{th}$ months of age begin teething, then those who had developed their deciduous teeth. The last group stems from the ability of older infants to make sounds and express themselves once their deciduous teeth had reached occlusal contact (Philpott, 1991). This shift in burial practice was particularly evident during periods when cremation was common; inhumations from the Early-Roman period are associated with young infants whereas adults and older children were frequently cremated (Pearce, 2000). The remains of many neonates and young infants are segregated from other burials and often found in domestic contexts (Moore, 2009; Gowland, 2001). The domestic context of the neonate and young infant burials represent a tie to their mothers, who like the infants, also primarily functioned within the domestic sphere of Roman society (Millett & Gowland, 2015). In conjunction with traditional beliefs and religious practices, this link may represent their reliance upon their mothers. While Watts (1989) argues that inclusion of neonates into some cemeteries reflects the impact of Christianity on burial practices, it is more likely that as the Roman period ended and Christianity became widespread the division of young infant burials from the general population continued as unbaptized infants were typically not buried within the consecrated churchyards (Dasen, 2010). The consistent isolation of neonates and infants from the general population,

often in a domestic context, shows a clear distinction between stages, albeit small, within the life course.

Although writers such as Galen led to early studies suggesting Roman parents were "indifferent" towards their children, due to high mortality rates and burial practices, recent scholarship suggests this is untrue and that parents formed emotional connections with young children (Harlow & Laurence, 2002; Dasen, 2010; Lewis, 2016; Carroll, 2018). There is a noticeable shift in mourning and burial practices for infants over the age of 1 year, when under Roman law (Plutarch, *Numa* 12) infants could be publicly mourned. Among infants between 1 and 3 years, burials include a wide range of gravegoods comprising of statuettes or small figurines, coins and jewellery. Gravestones and votive offerings reflect the relationship between parents and their young infants, particularly those who survived the first few months or the period of time when they were swaddled (Carroll, 2018). Nina Crummy (2010) argues coins and representations of bears are found primarily among older infants, under 3 years of age and serve as protective devices. However, although evidence from the material culture record and literary sources support the use of protective pendants, examples of these types of objects in burials are very rare. While male infants received a *bulla* pendant, female infants often received a crescent-shaped *lunula* to symbolize fertility (Crummy, 2010). Found in the grave of an infant during the Butt Rd excavations in Colchester, England this particular *lunula* is made of silver and dates to the 3rd century (Figure 1). Worn until adulthood they serve as an example of the types of jewellery and other objects buried with older infants for protective associations (Rawson, 1992). Similar to the burial pattern among neonates and young infants, the burials of older infants also reflect the relationship between mother or the family and the deceased child with special emphasis in terms of gravegoods and burial locations reflecting their integration into the family and community.

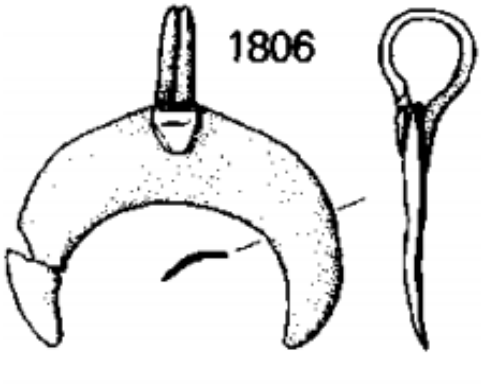



*Figure 1. Silver Lunula amulet, Colchester, 3rd century (from Crummy 1983, 51).*

At this stage in the life course, neonates including premature births and stillbirths, infants and very young children are limited in their own agency; therefore, they remain confined, limited to passive roles within the domestic sphere (Harlow & Laurence, 2002; Vuolanto, 2013 (McWilliam, 2013). In terms of the wider society, the birth and subsequent religious or legal milestones such as the *lustratio* allowed neonates and infants to participate in ceremonies within wider society; however, as infants are unable to exert any control of the situation or their own bodies, they are limited to being a passive participant. It is only once an infant is old enough to make a conscious decision or choice regarding their participation does their role shift to an active one. Overall, an infant's role as passive participants reflects their role both in the home and society.

### *3.3.3 Childhood*

With an estimated 50% of children throughout the Roman Empire dying prior to their 5th birthday, families frequently lost the majority of their children as infants or young children (Parkin, 1992). This had a profound impact on the family and societies overall attitude towards children. Although childhood as envisioned today is a relatively modern concept (Ariès, 1962) it would also be inappropriate to assume Romans viewed children as miniature adults (Baxter, 2006a). Children in the Roman period played an important role within the family and wider social community. It is important to understand that children had their own agency, which was generally expressed through performative acts (Vuolanto, 2013), and interacted with many different people aside from their parents (Bonner, 1977). Laws from the 1st-4th centuries (Gaius, I*nst. 2*.113; Ulpian, R*eg. I* 1.28) suggest childhood was viewed as a separate period of life for Romans and from age 7 until the age of 12 for a girl. For girls, childhood ended with puberty at which point they become eligible for marriage (Harlow & Laurence, 2002; Hersch, 2010); however, this does not necessarily mean that all girls were married directly after their first menses. Although there is primary source evidence that boys began their education earlier (Manson, 1983) most children were often sent to school from the age of 7 years. The period of formal education, between 7-12 years of age, serves as an additional division between early childhood when children did not participate in formal education and later childhood when children attended school or had tuition regularly.

### *3.3.4 Establishing Gender Roles through Socialization, Play and Education*

Socialization is a common way for societies to introduce gender roles and expectations to children. This can occur at school or in the domestic sphere, but in either instance focuses on teaching children to negotiate and find a place within a society based on gender expectations (McWilliam, 2013). Childhood for many Roman girls centred on play, which incorporated learning through imitation or observation. These performative acts took place outside of the

expected gender roles until children themselves became aware of their own gender. However, Gowland (2001) points out it is a mistake to project any sort of modern distinction between the expected material culture of children and adults. Gowland specifically mentions toys as potentially problematic because they limit the experience of childhood to that of the modern western construct. Not only is their debate around the binary system of gender in Roman culture, there is also limited information on when a non-binary system would have been introduced during childhood. Additionally, it is inappropriate to assume all miniature items were designed as toys or for children to play with (Lewis, 2007). Arguably, however, when placed within the appropriate cultural constructs, material culture can serve as a valuable tool for understanding the lives of children and their place in society.

#### *3.3.4.1 Toys and other child centred material culture*

During the Roman period, young girls of all social classes had access to toys, many of which served to reinforce these gender norms and expected adult behaviour (D'Ambra, 2007). Even poor children had toys made from cast-offs and everyday items which could be stacked, shaken to make noise (Figure 2) or turned into anything else a child could imagine (Harlow, 2013). In Rome and the provinces, these included a variety of pets, pull or ride-on toys and for wealthy girls, jointed dolls (Elderkin, 1930). Roman dolls had a far greater impact than simply serving to occupy a small child; they emphasised gender and social norms by training young girls in the proper way to carry and present themselves. The aim of Roman dolls was not to teach a young girl maternal skills but to give girls an opportunity to 'act out' their future roles overseeing a household, which explains why many dolls were modelled after grown women (Potter & Mattingly, 1999). Often placed within the *cultus* debate, which revolves around upper-class Roman women creating a look that involved the correct clothes, up-to-date hairstyles, expertly applied make-up along paired with the appropriate jewellery for the occasion, dolls served as an excellent education tool (Harlow, 2013). However, a range of types have been excavated from Roman period sites (Figure 3) meaning that dolls had multiple forms and children could interact with them in a variety of ways. Girls eventually outgrew playing with their dolls, but they still maintained that connection with childhood. Although debatable, some scholars argue dolls were kept from childhood to be dedicated just prior to marriage as a symbolic gesture of adulthood (Dolansky, 2012; Elderkin, 1930). Older girls played adult games, for example, knucklebones and dice (Figure 4). This shift could be related to their understanding of gender constructs as by the time they moved away from toys representing early childhood girls would have a concrete understanding of the roles and duties expected of a future Roman woman.

*Figure 2. Terracotta child's rattle in the form of a pig, 1st Century. Calabria, Italy. Image credit, The British Museum.*

*Figure 3. Rag-doll made from linen stuffed with rags and papyrus, 1st-5th Century. Oxyrhynchus, Egypt. Photo Credit, The British Museum.*

*Figure 4. Young girl playing knucklebones, 1st Century. Unknown location. Image credit, Antikenmuseum, Berlin.*

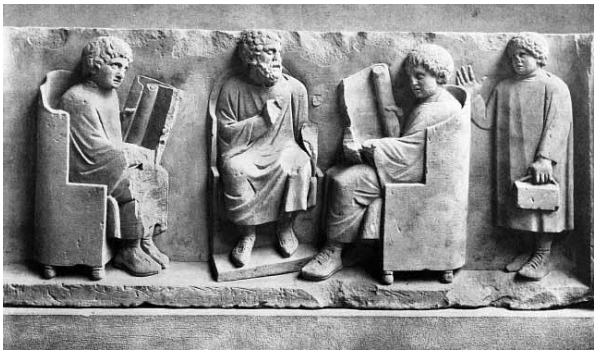


*Figure 5. Roman relief of a teacher and students. 2nd Century. Trier, Germany. Image credit, the Pushkin Museum, Moscow.*

#### *3.3.4.2 Education*

Education is an essential component of the life course, representing transitions along the path to adulthood (Hogan, 1978) as is closely linked in modern populations with sexual activity and fertility rates (Field & Ambrus, 2008) and can impact overall health (Lynch, 2003).

Having survived their early years, children at this stage transitioned into active roles within the family and began interacting with wider society. Already introduced earlier to their assigned gender roles through play, this stage focuses on learning by doing. Education forms an important role in the socialization of children and time spent around their peers influences the youngster's identity. Therefore, it is divided into two types: formal and informal. Formal education took place under the watchful eye of paid tutors while informal education happened in the home. Although some students were educated at home, informal education emphasized future roles as mothers and house manager's not traditional academic subjects. At home wealthier girls learned non-academic skills such as managing slaves and to embody the qualities

of an ideal Roman woman- to be sensible, just, chaste, practice moderation and to show courage (Musonius Rufus, *The Study of Philosophy*, 7 & 10). Mothers closely managed their child's education, particularly if it was carried out at home, by focusing on domestic arts, writing, reading and basic math (Bonner, 1977).

#### 3.3.4.2.1 Formal education

Formal educational opportunities for many women in antiquity were limited; however, education was extremely important to the Romans, particularly as a mark of social status (Eckardt, 2018). This emphasise on education is demonstrated by suggestions that students should be encourage to do well in school even if it required bribing them with money or toys (Vuolanto, 2013). Some girls in Roman society, mainly those born into high-ranking senatorial or equestrian families would have received a limited formal education (D'Ambra, 2007) combined with informal lessons at home. Profoundly shaped by Greek methodology teachers or tutors were brought from Greece to the Roman provinces. From the 2nd century, formal education began to incorporate Roman ideals alongside the Greek system. If the Roman education system spread throughout Britain, it would have likely been a mixture of Greek methodologies and Roman customs. Roman education fell into 4 stages: pre-elementary, elementary, grammar, and rhetorical schools (Bergh, 2000). The first stage, pre-elementary, focused on lessons learned in informally during early childhood within the domestic sphere. By the age of six or seven, girls not only had household responsibilities but also began their formal education. The second stage of Roman education focused on reading, writing, and arithmetic, at a *Ludus* or elementary school (Bergh, 2000). Wealthy girls who lacked their own tutors may have sat in on their brother's sessions at home (Musonius Rufus, *Should Daughters Receive the Same Education as Sons*) while older girls could be taught by the *Grammatici* (see 3.4.2) either in a group or at home. Only a select group of older boys could attend the 4th stage in Roman education, the Rhetorical school, which aimed to prepare boys for their roles in public office.

Evidence for the education of young girls is weaker than for boys; girls are not depicted studying in open-air schools with hired teachers in artwork (Figure 5). Instead, evidence of girls attending school comes from grave goods including inkwells (Eckardt, 2018) and written records. Famous Roman writers such as Juvenal and Martial mention their own education and the girls who took part in lessons (Bonner, 1977). Ovid alludes to the education of women by mentioning how reading Sappho might influence girls. He also remarks that both boys and girls will not read about Meander; a common author taught by a *Grammatici* as shown by wax tablets found with verses on Meander written by a teacher and copied by a student (Bonner, 1977).

*Lesbia quid docuit Sappho, nisi amare, puellas?*
*tuta tamen Sappho, tutus et ille fuit.*
*nec tibi, Battiade, nocuit, quod saepe legenti*
*delicias versu fassus es ipse tuas.*
*fabula iucundi nulla est sine amore Menandri,*
*et solet hic pueris virginibusque legi.*
(from Ovid, *Tristia* 2.369-370)

While the quote does not directly mention girls participating in formal education, the idea of girls reading poetry signifies they obtained a level of literacy to read Latin or Greek well enough to comprehend poetry.

Although the majority of girls received a limited education, senatorial or equestrian families had access to a wider range of schooling (Eckardt, 2018). In Rome, the government did not oversee education and every family was responsible for financing their children's education. Tutors or teachers received payments directly from parents and competition for highly sought after tutors was fierce. Tutors for wealthy families taught pupils additional subjects such as Greek and Latin poetry, history, and geography (Rawson, 1992). Written by a Roman family living in Egypt, The Giessen papyrus (2nd Century AD), consists of a discussion regarding the education of a young girl named Heradous. It states that her tutor should receive pigeons and small fowl in exchange for providing their daughter with more attention. It goes on to further state the necessary equipment including books the girl would need for school. Evidence for girls in education is an important aspect of their lives and impacts the life course. This also shows how young girls interacted with non-family members outside of a domestic sphere and among their peers.

#### 3.3.4.2.2 Formal Education in Roman Britain

Hitherto there is little direct evidence for a formal education system mimicking that found in Rome and the surrounding areas in Roman Britain. This could stem from two conclusions, the first is that education was so limited in Roman Britain that there is no evidence for it. The second is that education was so commonplace that few felt it was worthy of commemoration. It is possible that, like other boys from aristocratic provincial families, some wealthy boys were sent to Rome for schooling to overcome the lack of opportunities in Britain (Salway, 1993) but again this is an assumption with limited evidence. In fact, during the 1st century, when Agricola was governor of Britannia, he made it a priority to provide instruction for the sons of leading families in Latin language, rhetoric and literature so that boys wouldn't need to be sent away for school (Tacitus, *Agricola, Book XXI.II*). It was a priority of his to provide this type of education

for aristocratic boys and based on tablets uncovered in Britain some formal education was taking place in London (Figure 6) and near Hadrian's Wall (Vindolanda tablets 118, 119). Evidence of literacy among women (Vindolanda tablet 291) shows that it is likely at least some girls in Britain received an education but it is not possible to determine literacy rates or to what extent the literacy rates fluctuated during the Roman period and were heavily influenced by a family's socio-economic status and geographical location.

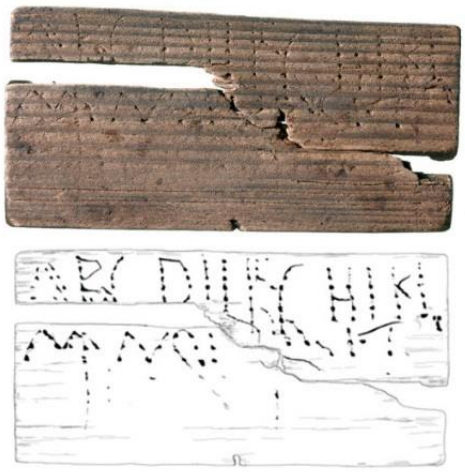


*Figure 6. Writing tablet showing alphabet, 1st Century, London. Image Credit, Museum of London Archaeology (MOLA).*

#### 3.3.4.2.3 Alternatives to formal education

With the cost of formal education beyond the reach of many families during the Roman period, girls might have received an alternative education. For slaves, a practical form of education revolved around future duties with knowledge passed down from older slaves or family members. Viewed as an investment, slaves received a limited education that focused on foundation skills including basic reading, writing and mathematics because this would increase their value (Adkins & Adkins, 1994). Slave and freeborn children living in the same household might receive tuition alongside each other in basic reading and writing. An additional option outside formal education was an apprenticeship. This was slightly different from the modern version as the length of time could be much shorter and centred on the crafts industry. Entered into at 12 or 13 years of age, girls from poorer families or slave girls entered into apprentices to learn a skill or trade or as a means to ease the burden of providing necessities for the child (D'Ambra, 2007). Although more common among boys, there is some evidence for girls entering into apprenticeships which could last for a few months up to 6 years (Saller, 2010). This would have affected their role within the family unit since apprentices traditionally live outside of the family home, perhaps even in a different city. Not only did this alter the domestic education for girls whose families or owners chose an apprenticeship, it prematurely removed them from their familial homes. Despite leaving the family home, girls who were serving as an

apprentice has limited agency as their master would have been responsible for their conduct. However, it also allowed girls to gain a valuable skill which could be used for economic independence as adults.

Girls also learned responsibility and about their expected duties as adults by participating in household chores or by mimicking adult responsibilities. In upper-class households, this involved using small tasks such as presenting the child with a smaller version of an adult lockbox. The child could then put their special toys or mementos into the lockbox for safekeeping and learn responsibility by keeping the key safe. This act mimicked one of the main duties of a *matrona* who oversaw all items of value within the house ranging from wine to jewellery and textiles (Vuolanto, 2013). Keeping the key to the family lockbox was one of their most important duties in regard to household management. In the archaeological record, objects such as this might be construed as a toy designed for fun. However, when put into the correct cultural construct the lockbox and guarding of the key shows that it is more than a toy, it is a lesson in expected duties. Other tasks of a *matrona* involved managing slaves and running the household. Young girls learned household management skills through chores, such as helping a slave fetch wine from a cask. Designed to be flexible, the frequently informal learning process allowed duties to change as a girl matured and began to prepare to manage a household of her own (Vuolanto, 2013).

Unlike their slightly older counterparts, young children remained within the domestic sphere; however, they were able to take on an active role within the family. It was only through their access to education or need to assist parents that they took on roles within the wider community, in which they typically remained passive participants; more often than not, they remained limited by their age, physical development and the hierarchical structure of Roman culture. As they grew older and more mature, their interaction with others became less reliant on adult/child relationships and focused on relationships with children their own age who represented their key social group. Older children played games with friends such as knucklebones, a game which continued to be popular into adulthood (Harlow & Laurence, 2002). However, much of their socialization would have been limited to other children within the household, which included slaves, freemen and various relatives. Within the wider communities, they remained passive participants, although as they learned new domestic skills such as weaving, young girls slowing transitioned into active members of their households.

## 3.4 Adolescence

As a period of maturation, adolescence among the Romans marked an important transition in the life course of a girl and often involved her increased incorporation into wider society as a

woman. However, it was also a gendered experience and boys in Roman society had a transitionary period during adolescence in which upper-class boys would serve as an assistant to their father or uncle to learn about business and entertaining guests (Harlow & Laurence, 2002). While in lower-class households, sons would help their fathers by learning their trade. Eligible boys marked the end of childhood with a specific event, 'taking up the toga', which publicly displayed their transition from boyhood into manhood. However, girls did not undergo a specific event or transitionary period; there was no female equivalent to 'taking up the toga' (Casson, 1975). The most important event that occurred for females during this time was puberty, particularly their first menses. This served as a dividing line between childhood and adulthood. The differences in socially desirable behaviour grew from subtle distinctions as infants or young children to a vast chasm by this stage in the life course. Boys had access to wider society and were encouraged to participate in public affairs, while their female counterparts remained trapped in the domestic sphere. Adolescent girls had limited options to be an active participant in society, particularly prior to marriage, outside of selected festivals or daily domestic tasks such as fetching water.

It is easy to focus on the physical changes that occurred during adolescence, as it was a period of visual physical maturation. However, Romans also saw it was also a period of emotional growth. According to Horace (*Ars Poetica* 156-8) and Ptolemy (*Almagest*), it was during this stage that girls developed logical reasoning. Therefore, girls had additional responsibilities and considered ready for marriage much earlier than their male counterparts who battled uncontrollable and wild sexual urges. During adolescence, the health of girls improved and Celsus (*De Medicina* 2.1) noted they were likely to overcome childhood ailments and enjoy their best health in spring. However, any new ailments such as allergies that remained through this stage in development were likely to become chronic. Additionally, at this age new acute diseases developed such as fits or consumption and spinal deformities. Hippocrates (*Aphorisms*, 5.7) specifically references epilepsy that occurred on or before puberty may change over time but if it occurred after the age of 25 it would remain until death. The relationship between adolescence and spring focuses on links between the weather, both hot and cold, and the emotions of an adolescent reflecting their psychological development.

### *3.4.1 Puberty*

A mix of biological, socio-economic and environmental factors including diet and overall health determines the age at which an individual enters puberty; therefore, the age at which girls began puberty and had their first menstruation is highly debatable. Literary sources from the 1st and 2nd centuries CE claim girls as young as 13 years of age should be prepared for the coming of their first menses with massages and diet, with the expectation that menses would begin

during their 14th year (Soranus, *Gynacia* 1.20). While the later Emperor Justinian (*Institutions* I. tit. 22), who wrote during the 6th century CE, concluded girls began puberty at the age of 12. However, many of the medical practitioners such as Soranus and Galen based their findings on upper-class or aristocratic girls, as their families could afford expensive medical practitioners. These girls also had a superior diet with access to a wider range of foods. The age at first menarche is directly influenced by nutrition and smaller family sizes (Hopkins, 1965). However, the Roman diet varied between both status and gender. Wealthy children of either gender ate foods similar to their parents, while poorer children- particularly girls, ate "plain foods" such as porridge. In Britain, families came from throughout the Empire and from the native population; therefore, diet is not as straightforward as in other regions. Due to differences dietary preferences between those living in Roman Britain and in Rome, combined with the general availability of foodstuffs to predominately lower-class families it is likely that menarche occurred in the late-teens (Allason-Jones, 2005). However, as in Rome, this would have varied by girl based on a range of internal and external factors.

### *3.4.2 Continuing Education*

Adolescent education has long-term impacts on the female life course and can result in higher literacy rates along with better decision-making abilities resulting in more stable marriages and successful pregnancies. Additionally, it helps to solidify their active role within the community (Clausen, 2006). Many writers such as Soranus advocated that girls be married to coincide with their first menses which would have stopped their education prematurely. However, for some wealthy girls' marriage was not the end of their education. Husbands encouraged their wives to continue learning through a range of intellectual pursuits or *patronage* (Hemelrijk, 1999). Additionally, even among upper-class families not all girls were married at 14 or 15 years of age. By remaining in the family home for an extended period, girls were able to contribute to the family and, at times, continue their education (Figure 7). However, most Romans would have lacked the necessary funds to pay for their daughter's further education. Continuing education not only cost money for tutoring but also took the daughter outside of the household where she would have been an asset to the family. An interesting note regarding the *Grammatici* is the idea of boys and girls remaining together in lessons, in theory, this gave them equal access to the same level of education. As with the *Ludus* pictorial evidence of this is lacking, particularly in the provinces (Bergh, 2000). It is also at this stage girls would have achieved the required literacy levels to enjoy poetry and other complex writings. Philosophers advocated studying philosophy as helpful to women in understanding the 'science of living' and their own emotions (Musonius Rufus, *The Study of Philosophy*, 3 & 4).

Although rare, some young women had an opportunity to continue their education under the guise of becoming a better wife. This further education would prepare them to manage large and complex households including the budget and storerooms. As wives, they would also potentially be involved in their husbands' businesses, and for upper class women, his political life and in managing his estates. Additionally, the *matrona* participated in all social aspects of the household including her husband's more informal meetings and dinner parties (Hemelrijk, 1999). A good education could provide a woman with the background needed to engage their husbands and his friends in thought provoking conversation which was considered to be an attractive quality in a wife (Bergh, 2000). However, much of the information on women engaging with their husbands outside the domestic sphere or managing vast estates would have been limited to a small proportion of women. Many women would have worked alongside their other family members as farmers or ran small family owned businesses throughout the empire and spent time looking after their children.

An additional option for adolescent girls of various backgrounds would be to enter medicine as either a *medica/iatrinē*, the female version of a physician or as an *obstetrix/maia*, the midwife (Flemming, 2007). As medical knowledge passed down through hands-on observations and literary works such as the Hippocratic Corpus and works by Soranus, women entering the medical field would have needed a strong foundation in literacy. As a result of the education requirements, women entering this profession would have mainly come from privileged backgrounds (Todman, 2007). However, the majority of epigraphic and written evidence from the imperial period stems from the Greek East (Flemming, 2000). By the 3rd Century CE it became difficult to determine how many and when women practiced medicine as either physicians or midwives in Roman Britain. It is highly likely that some women in Roman Britain practiced folk medical traditions, served as trained and experienced midwives. They also worked as knowledgeable physicians for women suffering ill health outside of childbirth; however, it is impossible to determine if they also worked with male patients.

*Figure 7. Adolescent girl with stylus and writing tablet. 1st Century, Pompeii, Italy. Image Credit, The British Museum.*

### *3.4.3 Adolescent Burial Record*

In Romano-Britain, a shift occurs in the burial record of females between the ages of 10 and 15 years who have higher rates of grave goods than their male equivalents (Crummy, 2010). Some scholars relate this to their death before marriage and excess grave goods may represent their future dowry (Hopkins, 1965; Shaw, 1987). This shift creates an additional dividing line between young children and adolescents. A shift in grave goods appears to occur between young children and those over the age of 16, potentially representing different stages in the life course. Grave goods relating to the household, such as pottery and metal objects, become particularly common within the adolescent age group (Moore, 2009). However, this varies by site and can be influenced the type of settlement associated with the graves. For example, in East Yorkshire there was no significant difference in the amount or type of grave goods associated with this age, while at Mill Hill and Poundbury Camp studies suggest a difference between burials (Watts, 2005). This creates two issues; the first is a lack of studies that, similar to Dorothy Watts (2005), examines Romano-British grave goods from a wide range of sites. Many studies focus on a single site or groups of sites such as Alison Moore (2009). The second issue is the reluctance of scholars to sex adolescent graves due to controversial osteological methods for non-adults which are only just being explored; therefore, published information does not allow for a strong comparison or conclusions to be drawn of burial patterns in Roman Britain of adolescent girls (Arthur, et al., 2016; Gowland, 2001).

Adolescents was a period of great change, physically, psychologically and potentially geographically for girls. While for some adolescents served as an extended period of childhood

that allowed girls to continue living at home and continuing their education, for others it involved apprenticeships and possible early marriage. Unlike in modern society, there was not a clearly defined 'teenage' period for females as there was for adolescent and young adult males in Roman society. When a girl married, no matter her age, she moved from childhood into womanhood; her role within the family and society would shift yet again.

## 3.5 ADULTHOOD

For women, marriage often marked their full entry into adulthood and their ability to interact within both the public and domestic spheres. *Matrimonimum* in Latin comes from the base *mater* or mother, which directly relates to the main reason for marriage as a woman- to become a mother (Rawson, 2003). Throughout the Roman period, marriage was at the forefront of laws and controversies as the state or legal benefits were linked marriage or at least betrothal. However, this mainly applied to men who needed a wife to advance politically. Whereas for women, motherhood and the ability to have multiple children made them eligible for state honours. This makes marriage a crucial turning point in a woman's life and many of the rituals and ceremonies reflected this new social role and her new place within the family.

### *3.5.1 Marriage*

Young girls were groomed from childhood through play and informal education for marriage and motherhood. It served as the transitionary event into adulthood for girls and the terminus for years of hard work and dedication. As women never achieved 'adult' legal status, a male guardian always represented the future wife and from the Julio-Claudian period, state benefits or honours were tied to marriage and successfully producing children. This reinforced the patriarchal society in which Roman women lived.

In need of Roman citizens, Augustus tackled the lack of marriage and children among the upper classes in the *Iex Iulia* which dates from the 1st century CE. He introduced a minimum age for betrothals at 10 years old for girls and 12 years old for marriage. This contributed to the gendered experience of Roman marriage girls were expected to marry men twice their age. Using information gained from medical advisors and common knowledge, Augustan period marriage laws were based around the female reproductive period. The minimum age set was the earliest a girl would show outward signs, including menarche, of pubertal development. Whereas the upper ranges were based on the likelihood of a woman entering menopause and the ending of her reproductive period. Unless in mourning, laws required women to remain in a marriage or be married until they reached 50 years of age or their family would face a fine (Harlow & Laurence, 2002). This contributed to the high rate of second and third marriages among Romans. Often first marriages were political or social alliances among the upper classes;

however, among average Romans women were often married later in life and less likely to be concerned with alliances, particularly in the outer provinces. The emphasis on female reproduction and the creation of legitimate offspring who were Roman citizens is a direct result of the patriarchal society in which Roman women lived. Although they were limited in their agency under the laws in terms of marriage, women were able to express their own agency in other ways during such as managing the number of children and gaining influence among her peers.

Evidence from the Roman period on marriage, particularly wedding rituals, relies on upper-class male perspectives that are often non-participant based. Therefore, it is difficult to determine the exact views or experiences of women regarding both their own marriage and that of others. Even though much of their education in household management and playing at being a "*matrona*" as preparation for their future roles as wives, it is very difficult without sources written by women to understand their feelings on their wedding day or towards their husbands. Socially, marriage marked the main life event for a woman and served as her transition from childhood to adulthood. Regardless of her age or level of physical development, she was expected to undertake the same level of responsibility as any other married woman. The importance of marriage within the life course is evident by the high rate of funerary markers and gravegoods among young, unmarried girls. Since society viewed their lives as incomplete or unfulfilled by dying unmarried, these goods are thought to represent their potential dowries (Hopkins, 1965; Shaw, 1987).

Marriage served as the foundation for a wide range of social institutions including family relationships, the exchanging of property and inheritance laws; therefore, it is important to understand the age at which girls were married. As married women produced the majority of full-term pregnancies that lasted until term in the Roman period, thus making the infant more likely to survive, the age at marriage also influenced overall fertility rates (Shaw, 1987). Marriage was an important social and legal shift for a woman who moved from being under the *patria potestas* of her father, or alternatively if he was deceased her uncle or brother, to that of her husband's family. Therefore, the newly married woman would enter into a completely different family dynamic than the one she left in which her husband may not have been the family head, which could be his father or uncle.

### *3.5.2 Marriage Rituals*

One overarching event and one of the founding myths of Rome, the Rape of the Sabine Women, influenced Roman views on marriage and how girls perceived their role during the marriage rituals (D'Ambra, 2007). Commemorated by writers including Livy (*History of Rome*, Book 1)

and Plutarch (*Life of Romulus*, 9-14), found on reliefs and orally passed down, the myth was common knowledge among Romans. The 'First Marriage' occurred when the founders of Rome, led by Romulus, lacked adequate numbers of women after the founding of the city (Miles, 1993). The Sabines were a local tribe already living in the region whose leaders previously prevented marriages between the Romans and Sabine women. In response to their refusal, Romulus decided to take the women by force. In order to gain access to the women the Romans organized a festival and invited the Sabine men. During the festival Romulus allowed or encouraged Roman men to kidnap and then marry Sabine women who were left vulnerable. When the Sabine men heard of the kidnappings and returned with reinforcements, the women made peace between the two groups stating they wanted to stay with their Roman husbands (*Life of Romulus*, 9-14). In exchange for the women, Roman leaders agreed to allow Sabine men to participate in Roman government (Miles, 1993). This represents a key aspect of future marriages, which would often serve as a tool for the creation of alliances particularly among the elite, producing an intricate and complex web of marriages among Romans (Bush & McHugh, 1975; Harlow & Laurence, 2002). Roman notions of marriage stem from the kidnapping and systematic raping of women, who then align themselves with their abusers thereby creating peace. This power relationship was re-enacted throughout the marriage ritual. The story of the Sabine women also reflect how Romans perceived the role of women in wider society.

Roman law allowed for three types of marriage each aimed at a different type of relationship or social class. The *usus* was a domestic partnership, often used by slaves because it allowed children to become legitimate heirs after a year of cohabitation. *Coemptio* was a civil ceremony in which the woman, similar to property, was simply transferred to the husband when her father or guardian relinquished their ownership of her. The most frequently documented type of marriage, the *confarreatio* (Figure 8), was the most formal (Pomeroy, 1975). The *confarreatio* began with the girl setting aside her *toga praetexta* and offering her dolls to the gods; this began the first step in her transition into womanhood. The bride wore a long white tunic made from wool known as a *tunica recta*, often created on an old-fashioned loom by the bride (D'Ambra, 2007). To accompany the tunic, she also wore a traditional veil (*flammeum*) which could be either white or saffron. This paralleled a similar ritual for boys when they set aside the toga praetexta and took up the *toga virilise*. However, the boys' ceremony took place in public sphere in front of an audience, whereas for girls the ceremony was private resulting in a gendered experience (Rawson, 1992).

*Figure 8. Sarcophagus displaying a wedding ritual, note the somber facial expressions, the marriage contract in the groom's hand and the revealing pose of the bride's hand that encouraged by another. 2nd century, Rome. Image credit, The British Museum.*

The marriage ceremony then consisted of a set of rituals carried out throughout the day. As with modern ceremonies, an important aspect of the official ceremony included exchanging of vows, however, in the Roman period, all marriage ceremonies contained the same vows, "*Ubi* or *Quando ti Gaius, ego Gaia*" ("Where or When you are Man, I am Woman"). These words reflect the interconnectedness of the bride and groom while reinforcing gender stereotypes. In the evening, the ceremony continued with the new bride formally torn from the arms of her mother, harking back to the Sabine women. Next, a procession following a boy carrying a torch led the new bride through the city to the husband's home. Once the procession arrived at the house, the new bride symbolically refused to enter her husband's home, sometimes she was prodded with a spear (Williams, 1958). The underlying relationship between taking a woman from her family and a wedding remained pervasive throughout the Roman period; it would have affected the way a girl approached her wedding day and represented the way society viewed new wives (Miles, 1993). Regardless of their chronological age, females who entered into marriage became women. Romans based age on physical development, which varies within a given population and adds additional difficulty to determining the appropriate age for a girl to enter into a marriage as some are physically developed years ahead of their peers. According to Roman male writer's marriage was primarily designed for procreation purposes. As a result, it

is highly likely that families waited for girls to be physically capable of carrying child and this is suggested by primary sources including Soranus (*Gynaecia*, 1.34) and Rufus (*On Girl's Regimen and on Women's Regimen)*. Overall, marriage during the Roman period served to strengthen the gender dichotomy of the period and reinforce the role of women as mothers whose agency was in many situations less valued. However, it is also important to remember that many of the writings on marriage are from an elite, male perspective and are unlikely to reflect the thoughts of all males given the vast geographic region and length of time Romans ruled various provinces.

### *3.5.3 Debate on Age at Marriage*

The minimum age for a female to enter into a betrothal or marriage is debated, particularly in the Roman provinces and across the Roman period. It is plausible wealthier girls entered into betrothals and marriages at a younger age. Late marriage allowed girls from poor families to continue contributing towards their familial household into their late teens or early twenties (Shaw, 1987). However, not all scholars agree, and the debate often stems from the types of sources used. Under the *Lex Iulia* the length of betrothal is shortened to two years and the minimum age of marriage set at 12 years for girls. As a result, the minimum age of betrothal during the 1st century would be 10 years of old. However, based on Modestinus (*Digest* 23. 1. 14), Laes & Strubbe (2014) argue that by the 3rd century the minimum age for betrothal was 7 years of age.

#### *3.5.3.1 Inscriptions*

Aside from written records, inscriptions or funerary markers dating to the Roman period are used to determine the age at which people married. However, this approach is complicated as ages represented on funerary markers contradict literary evidence. In the case of Minicia Marcella, the funerary marker states an age of 12 years old. This is contradictory to Pliny the Younger who states her age as 14 years old when she died (D'Ambra, 2007). Based on funerary inscriptions Hopkins (1965) argues the age of marriage was quite young for girls. His results state that 43.4% of "Pagan" tombstones showed girls married between 12-15 years and among "Christian" marriages girls 41.7% married between 15-18 years of age. The separation into "Pagan" and "Christian" groups is potentially very superficial and emphasises a geographic or social divide. Hopkins (1965) relied on inscriptions from a single study, which examined funerary epitaphs. To determine age at marriage he examined both the year and age of death along with the length of marriage, then worked out the age at marriage. The problem with these particular epitaphs is location; over 90% of the 400 inscriptions come from Rome and the surrounding area in Italy. Vast parts of the western empire including Britain contain no inscriptions of this type, making it inappropriate to use when discussing marriage in Roman

Britain. More recent studies have been conducted on funerary inscriptions (Saller, 1994) using the Coale-McNeil model on nuptials (Coale & McNeil, 1972). This model attempts to be culturally specific and views marriage as a multi-step process, beginning with a woman becoming eligible for marriage, courtship, engagement and finally marriage. Based on the results of using this model scholars (Coale & McNeil, 1972) have determined the typical age of marriage in the Roman period to be older than previously thought. On average, women were married at 20 years of age and men slightly older, at 30 years of age. Women remained in their first marriage from an average age of 15 to 40 years old. Among the senatorial class, the average range was slightly younger which is tied to class differences and reflected in the Roman law codes. Studies such as those conducted by Scheidel (2011), which counted the husband-to-wife and wife-to-husband inscriptions are far more accurate despite their limitations to only those who could afford commemorations.

Many factors can influence age at marriage including local customs, economics and geopolitical events. In Roman Britain, where there is burial evidence for individuals from across the Roman Empire including North Africa (Eckardt, et al., 2014; Leach, et al., 2010), a range of wealth displayed in grave goods and burial practices (Molleson, 1989; Casa Hatton, 1999) along with the withdraw of Roman troops and government officials during the end of the 4$^{th}$ century, all would have had an impact on the age at which girls were married. Rome and Roman Britain were patriarchal societies in which, according to the surviving androcentric sources, procreation was a primary reason for marriage. As a result, it is unlikely that a girl would have been married prior to her first menses as she would not have been developed enough to fulfil her wifely duties under Roman law; however, this would not prevent a betrothal from occurring at a much younger age. Therefore, by determining the age at menarche and tracking obstetric development throughout puberty it lends support of the minimum age at which girls were potentially married.

#### *3.5.3.2 Second Marriages*

Under Julio-Claudian laws, women were required to remain married until they reached 50 years of age, approximately the age of menopause. With an early first marriage and accessibility to divorce, many women went on to have second and even third marriages (Allason-Jones, 2005). The age of women during their second marriage has generally been of little concern to scholars but it could occur at any point in their life course and some girls who had very short first marriages even returned to school. It was only during their later marriages that women had more say in choosing their partners, particularly if they were entering into their third marriage (D'Ambra, 2007). In general, ceremonies for second and third marriages were also a smaller affair and lacked the range of formal rituals that accompanied the first marriage. This may be due to the emphasis on reproduction and producing children when women are entering into their

first or second marriage, however, by their third marriage reproduction is most likely less of a concern if even possible. The high rates of multiple marriages had a profound impact on the social make-up of the family home, with stepchildren or adult children learning to live alongside new family members. This created a new family dynamic often alluded to in classical literature and led to the development of the 'wicked stepmother', a character found in numerous plays and other literary works demonstrating the influence of successive marriages on Roman society (Gray-Fow, 1988; Noy, 1991).

#### *3.5.3.3 Divorce*

According to Roman law, the husband or wife could initiate a divorce. Reasons for divorce varied and ranged from the lack of children to changes in political allegiances- such as the case with Sulla's stepdaughter, Aemilia who was forced to divorce her husband and marry Pompey. The phrase "*Tuas res tibi habeto*" or "Keep what is yours for yourself" reflects the policy of dividing property, a key aspect of a divorce. An example of this was the way guardianship of the children was determined. Any children would remain with their father after the divorce since he was their legal guardian. According to the *Lex Julia*, this idea included the restoration of the wife's dowry and offered the opportunity for future marriages as the dowry for most Roman women averaged a year's income or 5-10% of her father's estate (Saller & Garnsey, 1987). Older women were able to maintain some independence after a divorce or the death of their husband by avoiding remarriage. This independence was assisted by changes to the law that allowed women to inherit from their parents' estates (Ulpian, *Rules* 6.1-13). However, according to the law the majority of Roman women were unable to make their own decisions or act as independent agents. Adult women existed in a period in which the law treated them similarly to children, unable to represent themselves. Despite this, women were able to display their own agency and gain some independence with wealth or age. It is likely that the limitations set by Roman laws varied throughout the provinces and those from less affluent backgrounds were able to exert more control over their everyday life.

### *3.5.4 Marriage in Roman Britain*

Although the marriage ceremony was highly ritualized, it is difficult to determine exactly which rituals transferred to the provinces. While initially Roman soldiers stationed in Roman Britain, and the natives who joined the army were prevented from marrying under Roman law, they commonly had *concubines* or unofficial wives who lived in the *vici*, or town attached to the army camp (Phang, 2001). Therefore, in Roman Britain evidence for marriage comes from the *vici*, since that is where women and children frequently resided although this is highly debated (Allison, 2006). Due to the high number of soldiers stationed in Britain, the local population was strained in terms of potential wives as soldiers competed with local men and given the pay,

land grants at retirement, potential for citizenship, and the local Briton's may have preferred Roman soldiers. However, by the 2nd century, soldiers throughout the Empire were allowed to legally marry, in turn allowing their children citizenship even if their mothers were Britons (Allason-Jones, 2005). Additionally, this change allowed veterans to pass down land and other forms of inheritance to their children along with signalling a shift in the types of dedications with terms for husband and wife replacing *uxores* (illegitimate marriage or common among soldiers or slaves who were prevented from legal marriage) or *conigues* (concubines), both of which were commonly used (Garnsey, 1970).

Whilst dedications between husbands and wives were common throughout the Empire, Britain contains the highest number of dedications procured by husbands to commemorate their wives (n=28). Wives also set up dedications for their military husbands (n=17) which is exceptional, even among the frontier areas (Scheidel, 2011). However, dedications or inscriptions cannot accurately reflect the local communities as the cost for such memorials were prohibitively expensive for most veterans and their families living in Roman Britain. Therefore, the majority of those commemorated belonged to the *equites singulars* and were commemorated not by wives who lived elsewhere but by their fellow soldiers (Saller & Shaw, 1984).

### *3.5.5 Unmarried Women*

Unfortunately, there is very little evidence for women who were never married outside of literature and plays, thus making it difficult to determine what percentage of females may have remained unmarried. Unmarried women were penalized by the state through taxes (Dio Cassius, 54.16.1-2) and could not move through the expected life course of puberty -> marriage -> motherhood. In Roman Britain, the influx of young male soldiers during the 1st and 2nd centuries may have led to an imbalance between genders and this may have affected the rate of married women.

### *3.5.6 Pregnancy and Childbirth*

For a Roman woman, producing a child was a significant aspect of their social identity and another important life event. Under Augustus and throughout the Roman period, motherhood was highly praised, and the government entitled mothers special honours or benefits for having large families. However, due to the lack of written evidence from the female perspective, little is known about how Roman women dealt with pregnancy related issues first-hand. This lack of female input lead to an androcentric viewpoint that removed the female importance or influence from beliefs on conception. *The History of Animals* by Aristotle dates to the 4th century BCE and continued to perpetuate the outdated misconception that pregnancy was the result of semen mixing with menstrual fluid. This gives supremacy to males when forming a fetus, placing

women as passive participants in conception since they have no control over the timing of menstrual fluid. Spurred on by androcentric ideology, men such as Soranus also suggested that a woman did not contribute towards the "seed" and served as a passive storage facility to nourish the foetus (*Gynaecia,* 6.2). Many of the questions early authors had regarding conception stemmed from attempts to understand paternity and why some offspring take on characteristics of a particular parent (Preus, 1977). Later authors, Galen and Hippocrates, wrote about pregnancy from a medical perspective that frequently conflicted with the Aristotle viewpoint but still left women with the subordinate role (Preus, 1977; Boylan, 1986; Boylan, 1984). In *On the Natural Faculties* and *On the Usefulness of the Parts*, Galen writes on the results of his dissections. He concludes that the female ovaries or 'female testicles' play a role in conception, a clear advancement on the knowledge of female anatomy which allows women to play a more active role in conception than was advocated by men such as Aristotle, Pluto and Hippocrates. Galen, in *On Seed*, also parts ways with Aristotle when discussing the role of semen and menstrual fluid, as he argues that both fluids must mix for conception to occur. This also allows the female to play a more active role in conception with semen providing the marrow, nerves and brain while the menstrual fluid provides the blood; however, he also states that the egg and fluid found in the vaginal region during sex along with the egg provide the necessary food for the semen to develop which then results in conception (Preus, 1977). However, this theory again places women in a more passive or subordinate role during conception by crediting the male sperm with dictating the resulting characteristics of future offspring.

Most Roman era medical practitioners suggested girls wait until their late teens before their first pregnancy. Medical practitioners learned to associate other changes related to physical maturation, such as additional fatty build-up in hips and thighs to determine if a woman was ready for pregnancy (Soranus, *Gynaecia*, 1.9). Hippocrates noted that if a woman was malnourished or too thin, she should not become pregnant until she was healthy (*Aphorisms* 5.44). Additionally, they recommended women refrain from being too overweight. Based on physical maturation, Soranus suggests 15 to 40 years of age as being most appropriate for pregnancy (*Gynaecia*, 1.34) which supports Roman laws dating to Augustus. The *lex Iulia de maritandis ordinibus* and *les Papia Poppaea* included sections on inheritance rights and stated expected childbearing ages for women were between 20 to 50 years of age but 25 to 60 for men (Rawson, 2003). In the provinces, such as Britain, it is speculated that girls gave birth to their first child in their late-teens, early-twenties or even later due to economic reasons (Allason-Jones, 2005). Without specific records it is very difficult to determine the age at which women first married as much of the evidence stems from inscriptions that can be inaccurate.

Not all Romans agreed on age playing an important role in pregnancy with Celsus (*De Medicina* 2.10) suggesting a mother's strength or overall health mattered more than her age. The concept of health in the Roman period relied on medical ideas founded on the Greek concept of four humours: yellow bile, black bile, phlegm, and blood. These humours not only created a person's disposition and temperament, they also dictated their overall health. When a person fell ill it was believed that his or her humours were out of balance and in order to cure the person balance of the humours must be restored (Baker, 2013). Romans categorized women as cold, which lead to their genitals being carried inside the body (Galen, *On the usefulness of the parts of the body*, 14.6-7). When confronted with problems conceiving or during pregnancy, the idea of humours determined the appropriate course of action or time for intercourse. Other conditions which dealt with female health are discussed by Pliny, Dioscorides and Celsus who are concerned about conditions which influenced the female womb (Flemming, 2000). The concern over the reproductive facilities of women contribute towards the androcentric nature of primary sources and are a reflection of a society in which women were revered for their ability to give birth.

For women who had trouble conceiving or whose pregnancies resulted in miscarriages, a range of remedies were available. However, many of these remedies included herbs which could potentially be dangerous. It was not unheard of for a woman to die from these concoctions (Hippocrates, *Aphorisms* Book 5; Pliny the Elder, *Natural History* Book 7; Celsus, *De Medicina* Book 2). A famous example is Eusebia, wife of Emperor Constantius II in the 4th century CE. Eusebia was known to be infertile and jealous of Helena, wife of Julian Caesar. Eusebia, possibly with the help of a midwife, gave Helena a commonly used slow acting poison known to induce a miscarriage. However, the poison eventually killed Helena (Ammianus Marcellinus, *Res Gestae* 16.10.18-19). General gynaecological issues were also addressed in a similar manner with recommendations for vaginal steaming. Although popular among many cultures, Greek and Roman writers suggest sitting over a bowl containing boiling water infused with mugwort or wormwood (Flemming, 2000). Galen (*On the Natural Faculties* 3.3) provides an explanation for miscarriages as being either a cause of nature such as a complication or "fore-ordained" shifting the blame away from the woman. Additionally, there are a number of Roman and native Britain fertility deities known as the *Dea Nutrix* or 'Nursing Goddess', who oversaw and protected women whilst pregnant and throughout childbirth. As the Roman Empire expanded, those living in newly conquered areas often experienced an intermingling of native gods or traditions with the Roman. It is likely that the belief in the goddess travelled to Britain with the Romans and underwent 'Celticization' from the traditional Venus figure (Laurence, 2012).

#### *3.5.6.1 Childbirth*

Childbirth was a risky affair in the Roman period. Many women and neonates died during the childbirth process with miscarriages and stillborn births making up as much as 20% of all pregnancies (Scott, 1999). Death rates for newborns were particularly high during the winter months as the newborn is most susceptible to diseases in the months immediately following birth. When combined with the poor weather and limited food supply this placed newborns in high risk situations (Carroll, 2018). In Roman Britain, the majority of perinatal deaths occurred during at 38-40 weeks, which overlaps with the period of expected delivery at about 40 weeks (Rohnbogner, 2015). Death could result from physiological issues, such as an obstructed pelvis. This occurs when the pelvis is too small to allow the neonate to pass through the birth canal. The result could range from needing forceps to help ease the neonate through the canal to death for both mother and neonate after days of unsuccessful labouring. Other issues could have been blood loss or infection. It is very difficult to determine the exact cause of death for Roman women during childbirth. Once born the risk of death remained high, with an average infant mortality rate of 300 per 1000 births (Todman, 2007) and approximately 30% of the original birth cohort dying within their first year (Parkin, 1992). This could stem from a range of complications during childbirth or from the mother not surviving. If the mother died and no wet-nurse was available, it is highly likely the newborn would also die. Therefore, childbirth and the period just after was of particular interest to the medical community at the time.

Issues with pregnancy began prior to conception with women who may be undernourished or having had multiple pregnancies in quick succession being physically unprepared to carry a child. Medical advice served to exacerbate the problem. Soranus discouraged expecting mothers from “eating for two”, which can result in smaller, undernourished neonates and weak, malnourished mothers (Scott, 1999). Hippocrates discussed a range of medical issues that could arise during pregnancy including diarrhoea and acute diseases. A common treatment for such conditions was bleeding or bloodletting. Due to their weakened state, Hippocrates recommends against this treatment by arguing it could lead to a miscarriage. He also suggested the likelihood of a miscarriage was increased if the foetus was larger than average, however, no measurements or weights were given (Hippocrates, *Aphorisms* Book 5) making it difficult to determine if neonates were undernourished at the time of birth.

#### *3.5.6.2 Midwives and birth*

During childbirth, Soranus (*Gynaecology* 1.67-9) recommends having an experienced midwife present although women could go through childbirth with limited assistance. The midwife had a variety of duties including preparing oil for injections and cleansing, heating hot water for compresses, gathering sponges, wool and bandages for swaddling, fixing a pillow for the

mother and using strong scents to help the mother sustain her strength during childbirth. Additionally, he recommended the use of a birthing chair as long as the birth progressed as expected (Figure 9). When it was time for the final pushes, the midwife sat under the chair and caught the baby as it was born. If the mother was frail or became weak during labour, a he recommended a couch in its place (Figure 10). Often the midwife impressed upon the infant their first gender identity when she informed the mother of the infants' sex based on visual characteristics (Butler, 1993).

*Figure 9. Relief depicting childbirth scene, from tomb of Scribonia Attica at necropolis of Isola Sacra, Rome, Italy. Image Credit, Getty Museum.*

*Figure 10. Relief depicting childbirth scene with midwives, possibly from the necropolis of Isola Sacra, Rome. Image credit, Science Museum, London.*

### *2.5.1 Complications and caesarean sections*

During the Roman period, a range of gynaecological instruments including speculums and forceps were available for use by midwives or doctors. The speculum, for example, was not limited to pregnancy but used to examine the birth canal or cervix (Figure 11). A key source for early gynaecological and obstetric practices in antiquity is Hippocrates, who discusses in his *Diseases of Women* breech births (King, 1998). He advises that if an arm or a leg presents itself first, that the limb should be pushed back into the vaginal opening and the infant should be forcefully turned so that it is no longer breech (1.69). As much of the Roman medical knowledge was passed down from the Greeks, during the Roman period Soranus built on the Hippocratic model. Soranus advises midwives on various issues which may arise during childbirth including malpresentation, where the foetus needs to be rotated prior to or during a vaginal delivery. This can occur either by manipulating the foetus to move into position as the Greeks did or through the use of forceps (*Gynaecology* 4.3). Forceps as mentioned by Soranus come in a variety of shapes and sizes (Figure 12 and Figure 13). Longer forceps (Figure 12) may have been used in childbirth due to their ability to reach within the birth canal while shorter examples (Figure 13) have wider ends, which would have made manipulating the neonates head easier. If the foetus died whilst still inside the mother, Soranus advises the midwife to use a set of long hooks (Figure 14) inserted via the cervical opening. Once the foetus was reached, the hooks were used to pull the foetus out through the birth canal. When using long hooks, the aim was to save the mother's life in the process. In dire situations, the midwife

was instructed to conduct a series of amputations in order to remove the foetus from the mother (*Gynaecology* 4.4), thus proving the mother's life was equal, if not more important than the neonates.

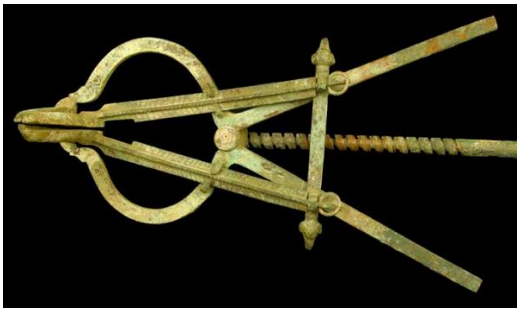


*Figure 11. Roman Speculum. From the House of the Surgeon. 1st century, Pompeii. Image Credit, University of Virginia Health Sciences Library.*

*Figure 12. Roman Forceps. 2nd-4th century, London. Image credit, The British Museum.*

*Figure 13. Roman Forceps. 2nd-4th century, Colchester. Image credit, The British Museum.*


*Figure 14. Obstetric hooks. 1st century, Pompeii. Image Credit, University of Virginia Health Sciences Library.*

When the fetus had died or the mother's life was at risk due to cephalopelvic disproportion or similar complication, a practice known as embryotomy was potentially used (do Sameiro Barroso, 2013). Hippocrates recommends dismembering the body of the features using a *piestron*, *osteologon*, and other instruments (*Excision of the Foetus*, 8.512-18). This procedure was described as 'using a boring and cutting instrument before crushing the child's head (King, 1998, p. 185). Within the archaeological record of Roman Britain there are two cases of embryotomy including Poundbury Camp in Dorset (Molleson & Cox, 1988) and Yewden Roman villa in Buckinghamshire (Mays, et al., 2012). Located within a group of infant burials from the later 4$^{th}$ century, PC 1414 a full-term neonate, displayed cut marks associated with an embryotomy. This included removal of the skull, which was placed near other bones such as the left distal humerus and tibia, is associated with cut marks along the third cervical vertebra. Additionally, the right femur was located near the right scapula which could have been achieved only after being dismembered (Molleson & Cox, 1988). It is likely that due to the larger size of the neonate, the mother suffered from cephelopelvic disproportion and the fetus possibly became stuck in the birth canal. Located in a rural cemetery consisting primarily of

infants, burial 38 is a 38-41-week fetus with cut marks along the right femur. However, unlike PC 1414, burial 38 has fewer cuts throughout the body and did not extend to the cancellous bone. As such, it is not possible to conclude that this is a case of embryotomy since ancient text call for a removal of the limbs, although other scholars suggest it is a possibility (Mays, et al., 2012).

Scholars often mention another option in problematic childbirths, which is thought to have potentially evolved from embryotomy, was to perform a caesarean section; however, this was extremely dangerous and required advanced knowledge of human anatomy. Roman mythology tells of individuals who were born using this method including Julius Caesar, after whom the procedure was named (Ellis, 2010; Hawkins, 2008), along with the gods Bacchus and Aesculapius (Ovid, *Metamorphosis* XV). It is unlikely Julius Caesar was born via a caesarean as his mother lived for many years afterward (Todman, 2007; Tonse, 2007). In all likelihood, the surgical procedure known as a caesarean has its roots in an ancient law that required women who died during pregnancy or in the midst of childbirth to be buried without the fetus (Ellis, 2010). Another option was using it as a last resort when the mother had died or was dying in an attempt to rescue the viable fetus (Todman, 2007). However, due to the high level of skill involved it is unlikely that caesarean sections, where the mother was expected to survive were performed during the Roman period, particularly in Roman Britain. Within Roman Britain, aside from evidence for the use of forceps (Bliquez, 2015) little is known about birthing interventions in which the infant was expected to survive.

Non-medical records of childbirth include writings by Pliny the Elder and Celsus, who while providing an outsider's perspective still perpetuate male-dominated literature. Celsus (*De Medicina* 2.7) discusses diseases or sicknesses that affected women in childbirth such as diarrhoea and fever but does not offer remedies to solve the problems. On the other hand, Pliny mentions herbs such as *hemerocalles* (*pancratium maritimum*) or sea daffodil as having the ability to alleviate pain after childbirth (*Natural History* 21.90). However, this plant is limited to the Mediterranean region. It would not have grown locally in the majority of Roman provinces, including Britain. Therefore, many of the herbal remedies used would have varied throughout the Empire when preparation demanded plants to be fresh, whereas dried versions could be transported at cost across the region. The majority of plants used in Rome would not be an accurate depiction of childbirth in Roman Britain where women relied on native British plants for remedies, likely information handed down through generations. In Roman Britain there are no surviving texts explaining the various plants used but there is evidence for family planning as shown by population levels in Roman-Britain (Todd, 2004). Other remedies for preventing conception, inducing abortion or influencing the sex of a fetus are mentioned

frequently by Galen and range from faeces to fat from various animals. Often there is a link between the sex of the animal and the goal of the cure, for example it is believed that if an animal is castrated they will have the medicinal properties of a female of that species as they have lost their virility making them shift from hot and dry to cold and wet according the four humours system (Flemming, 2000).

Romano-British females show a slight but statistically significant difference in nitrogen values from males in urban areas such as Queensford Farm (Fuller, et al., 2005) and in carbon from Gloucester (Glevum) and Cirencester (Corinium) (Cheung, et al., 2012). This might reflect pregnancy and the following period of lactation or a different consumption pattern from males with females consuming less animal and fish protein. However, studies conducted on dental health of adults from various Roman Britain sites including Ancaster, and Winchester, showed limited differences in caries, calculus, periodontal disease or antemortem tooth loss between males and females (Bonsall, 2014). The difference between the two studies could stem from the stress females experience during pregnancy and breastfeeding rather than an entirely separate diet. A prolonged period of breastfeeding would have influenced fertility rates by limiting the period between pregnancies. Additionally, multiple pregnancies in quick succession have a negative impact on maternal health (French, 1986; Todman, 2007). Evidence from the period includes a letter authored by Pliny the Younger (*Letters* 7.19) in which he mourns the death of a friend who died while giving birth along with the death of Julia, Caesar's daughter, who also died during childbirth (Suetonius Tranquillus, *Divus Julius* 26). However, the difference in values could also stem from personal preferences, economic stress resulting in a change in the family's needs, or social values (Fuller, et al., 2005). Additionally, writings by authors such as Soranus and funerary monuments are limited to the experience of wealthy women most likely living in and around Rome. These women could afford to have a number of people present at the birth including skilled midwives and experienced medical advisors (Carroll, 2018).

### *3.5.7 Additional Adult Responsibilities*

Aside from producing children, Roman women managed the household and, if needed, helped run the family business. Therefore, their daily life varied from those living in established towns or in rural farming areas. Aristocratic women traveling with their husbands attended official visits and hosted various political or religious functions. For those women living in towns, many had slaves to assist in daily chores such as laundry or food preparation (Allason-Jones, 2005). Others ran family shops alongside their husbands, often overseeing sales and accounting (D'Ambra, 2007). Finally, as previously mentioned, some women worked within the community as midwives. Religion also played an important role in lives of women. Religious

cults popular among women, such as Isis, gained followers throughout the Roman Empire including Roman Britain. However, by the late Roman period, Christianity became the dominant religion as evidenced by a shift in hairstyles and the use of make-up. (Allason-Jones, 2005). Overall, women during the Roman period carried out a wide variety of tasks, political and religious obligations that began during adolescence and shifted during adulthood.

## 3.6 Old Age

The events of old age, including widowhood, the death of loved ones or peers and the physical changes that occur during menopause, all had a profound influence on older women. While the average life expectancy in the Roman Empire ranged between 25 and 30 years, this lends itself to a misunderstanding on the age at which Romans died. The low average life expectancy was heavily influenced by a high percentage of the population dying in infancy and childhood. For Romans, the chances of reaching their 60's increased dramatically after the age of 5, as 80% of children who reached 5 would live to 20 years of age and 30% of those survivors would reach 60 years of age (Parkin, 1992). However, it is very difficult to determine the exact percentage of the population that would have reached old age, but it would likely follow stage 1 of the demographic transition model, marked by both high birth and death rates. It is possible that during small periods or in wealthier geographical areas communities reached stage 2 which contains high birth rates but slightly falling death rates due to very small advancements in hygiene, food availability or health care leading to a marginally larger aged population.

For those reaching old age, society perpetuated gender differences with older men retreating from public life outside of Rome and expecting their wives to follow. However, this reflects only a small portion of the population with upper-class families owning estates outside of Rome. Women often outlived their husbands and society viewed these women with apprehension. Although some women had the means to be legally and financially independent they disappear from the written sources and in some ways from society (Harlow & Laurence, 2002; Parkin, 2003). For women who had outlived their husbands, this was often the case as they entered their son's household and he became her new guardian. Tacitus (*The Annals*, 4.2) describes the struggle of Livia, left widowed after the death of Augustus to find a position within her grandson's home. These living arrangements were common among all levels of society and led to disagreements within families as the active social role of managing a family, household and children passed from generation to generation.

### *3.6.1 Menopause*

Menopause is the cessation of woman's fertile period and represents the final transition in the female specific course. Based on Augustan marriage laws (*Lex Iulia de maritandis ordinibus* &

*lex Papia Poppaea*), after 50 years of age women were no longer expected to be married. Therefore, this age can serve as a general estimation of when women reached menopause. Although Soranus suggests menopause usually occurred "not earlier than forty and not later than fifty" (*Gynaecology* 1.2), he also suggests that it may not occur until a woman reached 60 years of age. Pliny the Elder (*Historia Naturalis* 7.14) and Solinus (Parkin, 2003) propose a much younger age implying that woman stopped menstruation throughout their 40's and fully completed menopause by 50 years of age.

## 3.7 Death

Death is the final event in any life course. As it can occur at any age commemorations in the Roman world were heavily influenced by the female's place within the life course at the time of death. Age cohorts, geographical location and economic status profoundly affected funerary commemorations, thus making it difficult to use them when recreating life-tables. Geographical location, even within Roman Britain itself, determined the ages at which families and friends were most likely to erect a funerary plaque or small monument. Within rural populations, the majority of memorials (30-45%) where created for elderly members of society. While in urban areas, children under 10 years of age received a high percentage (20-40%) of inscriptions or other types of commemorations (Saller & Shaw, 1984). This represents a shift in the value assigned to women and children as an individual worthy of commemoration by society.

## 3.8 The "Others"

While a large portion of those women living within the Roman Empire followed the traditional expected female life course not all women were destined to run their own houses, family businesses, or have families of their own. Owned by the state, aristocratic and middle-class families, slaves in Ancient Rome held a host of positions ranging from domestics and skilled workers to, prostitutes and farm labourers. By the 1st century AD, the Empire consisted of 5-6 million slaves, nearly 10% of the Roman population (Harper, 2011). However, families could still sell children into slavery in order to pay off debts and young female slaves much like their plebeian counterparts, spent time learning domestic tasks such as watching young children or simple work such as fetching water. Adult women worked in a variety of settings and could hope to receive manumission from their masters through marriage by giving birth to his child (Adkins & Adkins, 1994). Female slaves captured from defeated tribes or brought from other parts of the empire contributed to internal migration patterns (Bradley, 1994). However, there is a distinct lack of information regarding female slaves in Roman Britain (Harris, 1999; Joshel, 2010; Joshel & Murnaghan, 2005; Joshel & Petersen, 2014), which could stem from low numbers of female slaves or simply a lack of evidence. Prostitutes could be male or female, a freeperson or a slave, and worked both in and outside of brothels. While there is no direct

evidence for prostitution Roman Britain (Allason-Jones, 2005), it is highly unlikely given the embedded use of prostitutes within Roman society that this group of women were missing in Britain.

The lack of literacy among female slaves and prostitutes, or at least no surviving works, make it difficult to understand their daily lives. However, recent developments in bioarchaeology are attempting to overcome the lack of evidence associated with slavery in the archaeological record. Traditionally this was done through written records and epitaphs on funerary monuments (Mattingly, 2007) or small finds such as shackles; however, these are rarely associated with a specific individual (Webster, 2005). By examining structural violence Redfern (2018) suggests using methods applied to exploring slavery in the Americas to Roman Britain including similar patterns of stressed childhoods. Potential evidence for slavery can be expressed through skeletal changes suggesting poor growth and development, diseases, injuries associated with physical stress alongside other factors resulting in high mortality rates among younger age groups. In the future osteological evidence may be a way to examine the lives of women in slavery further. Although some women had opportunities to bypass major events within the life course such as marriage or motherhood by dedicating themselves to religious orders, the majority of women outside of the expected life course were slaves and/or prostitutes. As they did not pass through the expected life course both groups developed their own traditions, however, there is limited evidence for this in the archaeological record.

## 3.9 Conclusion

Within the Roman period, a great number of social changes take place throughout the life course. By approaching the topic longitudinally, or from "cradle-to-grave" it is possible to understand the specific life transitions and events such birth, puberty, marriage and motherhood, which linked to important social changes for women. The incorporation of demographics and burial practices reflect societies view of women also changed throughout the life course.

Childhood and the various stages throughout the life course are contingent upon historical and cultural contexts. The life course perspective allows for an emphasis on the importance of historical and geographic contexts, processes and meaning over time (Bengston & Allen, 1993). Childhood is both a biological and social phenomenon; in the Roman period, children, like slaves, were marginalized from wider society. It should be understood as its own separate social category as it was influenced by geographical location and social status (Laes, 2006). During this period girls learned their assigned gender roles and the associated duties. However, girls remained in passive roles within the household and society.

Adolescence was a period of extreme change, girls moved from a passive role in their families' homes to an active one. Throughout early childhood, girls were not able to actively assert their agency or influence the wider household; however, as they matured and moved into adolescence, they began to take on new roles within the domestic sphere. This shift allowed them to participate in daily life and help them prepare for marriage. Their active role as an emerging leader was supported by their need to learn essential skills prior to marriage, although these skills were tied to a girl's socio-economic status. After puberty girls would be expected to marry, most likely during their adolescent phase or shortly thereafter. When this occurred, they would move from their familial home to that of their husband. In this new environment, girls would need to adapt to yet another change in their expected roles and engaged in active roles within the household and society. It also served as a potential terminus for their education and marked their entry into adulthood.

As adults the majority of women still lacked independence. They moved from the protection of their father or another family member to that of their husbands' *paterfamilias*. Within this environment, they carved out a new life for themselves, learning the traditions and customs of their new family. It was into this foreign environment they raised their children. Women most likely blended their own traditions with that of their husbands' family or if they had travelled to a new geographic location, they might incorporate local customs. This makes it very difficult to determine if women in Roman Britain received the same treatment as those living closer to Rome or within the city itself. What would have remained consistent is the patriarchal society in which the women lived. Across geographic regions, Roman women were expected to be subordinate to their husbands, focusing on the home or a family business and raising children. Children were particularly important if they were eligible for citizenship.

It was only in widowhood or old age were women finally able to control their own money and assert some independence. However, with this freedom came consequences and many elderly women found themselves marginalized, living on the fridges of society like living ghosts. They may be forced into the household of a child or other relative where the power and status they had as a previous *matrona* no longer applied. However, some women were able to exert influence within the arts through *patronage* and in politics by providing funds for campaigns. The final stage in any life course is death; however, drawing conclusions based how woman were treated after death is problematic. Burial customs often reflect the wishes of the deceased's family and do not always demonstrate how people saw themselves during life. Overall, the Romano-British female life course provides a glimpse into the treatment and status of women as they move throughout the different stages, balancing between the social and domestic spheres and shifted from passive to limited active participants in their own lives.

# 4 CLINICAL APPROACHES TO PUBERTY AND CHILDBIRTH

## 4.1 INTRODUCTION

Puberty, pregnancy and childbirth mark important transitions and events within the female life course. The way in which puberty is determined in modern populations does not directly translate into methods which can be easily applied to a skeletal sample and only recently with the work of Shapland and Lewis (2013, 2014, 2015) has this been possible. Although past populations would have focused on external cues for signs of pubertal development, hormones also cause females to undergo complex psychological changes during puberty. Additionally, age at puberty can be linked to the number of pregnancies a woman would expect to experience and influences the demographics of the past population being studied. For many women in past populations multiple pregnancies in quick succession was the direct result of lack of access to modern birth control methods and could have negative effects on a woman's body (Babinszki, et al., 1999).

## 4.2 PUBERTY

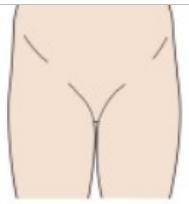
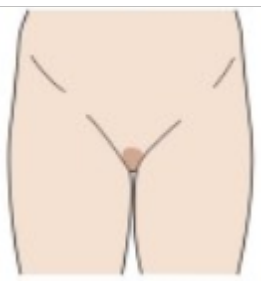
Puberty is the period in which an individual becomes capable of reproduction and is the result of endocrine and physiological changes (Kriegsfield & Silver, 2002) but can be influenced by a range of factors including nutrition, infection, stress and genetics. In most societies, it often serves as a bridge between childhood and adult responsibilities. Biologically adolescence includes the pubertal growth spurt or Peak Height Velocity (PHV) within pubertal timing or complete sexual maturation (Lewis, et al., 2015). Although puberty might mark the starting point of adolescence it refers to the physiological changes which occur, in modern populations, over a 3 to 4-year period; whereas adolescence is an all-encompassing term best used to emphasize the shift from a dependent child to an independent adult. In modern populations adolescence is divided into three periods: early (ages 11-13), middle (ages 14-16), and late (ages 17-20) with menses taking place in the early stages, and full reproductive maturity in the middle to late stages (Adeyemi, 2014). Due to internal and external factors the length of puberty has changed over time and varies between cultures as it is influenced by genetics and environmental factors (Francis, 2014; Sanchez, 2014). In some modern populations the physiological variation in age at onset of puberty can range from 4 to 5 years (Parent, et al., 2003). This variation has resulted in the development of clinical methods to monitor the progress of children as they approach, undergo and complete puberty, with a recent interest in the negative effects of early pubertal timing (Copeland, et al., 2010). While many clinical methods rely on soft tissue development, clinical radiographic methods can be used by

osteologists to determine the stage of puberty of a skeletonized individual (Lewis, et al., 2015; Shapland & Lewis, 2014; Shapland & Lewis, 2013).

### *4.2.1 Clinical Approaches to Pubertal Timing*

Many of the modern clinical methods used by physicians to assess puberty were developed during a longitudinal study conducted on girls (n=192) living in London in the 1960s. Having realized girls in Great Britain who seemed of equal health began to menstruate years apart with some as young as 10 or 11 and others their mid-teens, Marshall and Tanner (1969) used photographs to track the physiological development in girls every three months. By comparing the development of physical characteristics, including their pubic hair and breast growth, to linear growth and menarche, they were able to develop a classification system of 5 stages. While all girls progressed through each stage, they remained in a stage for a varying length of time. However, stage 4 can be passed through very rapidly, at times in a matter of months. Peak height velocity occurred between stages 2 and 3, while menarche occurred at some point between stages 4 and 5 in the majority of girls. The Tanner stages rely on external development such as hair growth which can be seen by members of the public and, therefore, are an important social cue regarding female development. However, they are limited in bioarchaeological studies since there is no relationship between the external development and that of the skeletal changes associated with pubertal timing.

*Table 2. Pubertal Stages based on Marshall and Tanner (1969). Image credit University of Chicago, Paediatrics Clerkship.*

| Stage | Breast Development | Pubic Hair |
|---|---|---|
| **I**<br>Prepubertal/pre-adolescent<br>No physiological development associated with puberty including the absences of pubic hair. |  |  |
| **II**<br>Breast and papilla form buds or a 'mound' shape while sparse, lightly coloured pubic hair begins to grow along the medial boarder of the labia major. |  |  |
| **Peak Height Velocity Occurs** | | |

| | | |
|---|---|---|
| **III**<br>Continued enlargement of the breasts but they continue to match the overall breast couture, with no separation. Pubic hair becomes darker, coarser and considerably curlier as it spreads sparsely over the pubes. |  |  |
| **IV**<br>The areola and papilla become projected to form a secondary mound above the level of the breast tissue. Pubic hair takes on the appearance of an adult but covers a smaller area and does not spread to the medial surface of the thighs. |  |  |
| **Menarche Occurs** | | |
| **V**<br>**Maturation**<br>Only the papilla remains projected as the areola recesses into the general contour of the breast tissue. Pubic hair forms an inverse triangle covering the medial surface of the thighs. |  |  |

### *4.2.2 Physiological and Endocrine changes in females*

While the physiological aspects of puberty are often visible to the wider society, it is the invisible endocrine development which serves trigger for the physiological changes. During this stage in development, three major endocrine systems: the adrenal, gonadal and hypothalamic-hypophyseal undergo changes. At the onset of puberty, it is the adrenal system which matures first and as a result increases androgen production. Due to the negative feedback system, the hypothalamus, pituitary and gonads work together with the hypothalamus controlling the pituitary gland which intern secretes two hormones. A luteinizing hormone and follicle stimulating hormone then trigger the gonads to produce sex steroids and ova. In girls it is oestrogen which is responsible for physical changes associated with puberty. As a system of checks and balances, the hypothalamus response to the hormone production is to cease or reduce production of the gonadotropin-releasing hormone which triggers a reduction in production along the rest of the system. During the onset of puberty, the threshold of hormones produced by hypothalamus ceases production is raised, allowing more sex steroids produced by the gonads to remain in circulation (Dubas & Petersen, 1993).

As a response to the adrenal gland releasing androgens the common physical changes associated with puberty such as body odour, acne, pubic hair growth and pre-pubertal growth take place. In females, oestrogen in the form of estradiol triggers breast development, fat distribution, long bone fusion, ovulation and menstruation (Frank, 2003).

#### *4.2.2.1 Psychological Development*

As adolescents enter puberty, hormonal changes trigger both physical and psychological development, which can influence their behaviour and interactions within their environment. Sex steroids, specifically estradiol levels in females, negatively affect the global grey matter volume resulting in decreases within the prefrontal, parietal and middle temporal areas including the right posterior hippocampus (Peper, et al., 2009; Allen, et al., 2003; Gur, et al., 2002) due to synaptic pruning (Giedd, et al., 1999a). These decreases in grey matter are offset by increases white matter found in the middle frontal, inferior temporal and middle occipital gyri (Peper, et al., 2009). As the prefrontal cortex is responsible for decision making and planning, inhibiting inappropriate behaviour, social interaction and self-awareness, synaptic pruning (Giedd, et al., 1999a) allows for the fine tuning of brain tissue responsible for these actions to change in response to the environment. An extreme reduction in grey matter has also been linked to higher rates of anxiety including social phobias in adolescents (Mueller, et al., 2015). This period in development also relates to dramatic changes in identity as youngsters become more self-reflective (Blakemore & Choudhury, 2006). Along with discovering their identity, females also become more sensitive to social cues and stresses, such as the perception of rejection, which can result in an increase of depression among young girls. On the other hand, this increased sensitivity can also be viewed as evolutionarily beneficial as it can assist with the infant bonding and caregiving needs associated with motherhood.

Upon reaching Tanner Stage III of puberty, a stage in which physiological changes associated with puberty become clearly visible, girls can experience an increased rate of depression which is linked to the changes in androgen and oestrogen levels (Angold, et al., 1999). As females progress through puberty, the rate of estradiol is 4-9 times higher than in prepubescents, thus resulting in a rapid increase in the later stages of puberty (Ikegami, et al., 2001). As a result, the psychology of puberty is closely linked with physiological changes (Adeyemi, 2014), but there is a demand for studies which link brain imaging with Tanner stages.

### *4.2.3 External and Environmental Factors*

In modern populations, 95% of girls begin puberty with the development of pubic hair or breasts between the ages of 8.5 and 13 years of age with peak height velocity occurring at 12 years and menarche at 13 years. There is a wide range in ages in which modern girls reach

Tanner stage 5 or full maturity as it occurs between 11.8 and 18.9 years of age (Francis, 2014). When puberty does not occur during the expected period, it results in either early onset or delayed puberty. There are a range of external factors which can influence the progression of a girl through puberty including diet and nutrition, past medical history, and, although debated, pollutants caused by urbanization or soil contamination (Kriegsfield & Silver, 2002). Of these, it is nutrition which has the largest impact on pubertal timing (Pozo & Argente, 2002).

Diet and the resulting potential nutritional deficiencies strongly influence pubertal timing. Studies conducted on rural populations which have maintained historical trends in food low calorie food production and consumption, such as the Inuit, Lapp and East Indian populations, have not been subject to the rising trend of younger girls entering puberty (Bojilen & Bentzon, 1968). In cases where very young children from Less Economically Developed Countries (LEDC's) migrated to More Economically Developed Countries (MEDC's) where nutrition was vastly improved, the resulting catch-up growth corresponded with an earlier onset of puberty that was closely aligned to their peers (Pierce & Hardy, 2012). In modern countries where body mass index has increased, this has resulted in a decrease in the age of pubertal timing. An opposite situation occurs in young athletes with low percentages of body fat, such as gymnasts, and results in delayed puberty (Davison, et al., 2003). This is a result of the endocrine system prioritizing the nervous system over the reproductive system. When treated with growth hormones children who lagged behind their peers in physical development experienced a period of rapid 'catch-up' growth and reached the same level of pubertal development as their peers (Ranke, et al., 1997). Environmental factors are important as girls cannot enter puberty until they have achieved a certain level of development, including height. One reason that malnourished or undernourished children experience delayed puberty is because they take longer to achieve the same level of growth, nevertheless, improved nutrition can allow for 'catch-up' growth and the onset of puberty (Francis, 2014). As a result, menarche corresponds closer to physical development than chronological age.

Precocious or early puberty can be the result of an increased body mass, particularly when girls are considered obese throughout childhood along with endocrine-disrupting chemicals (EDC); however, this requires further research on human participants (Walvoord, 2010). Additionally, girls who are born with a low birth weight or prematurely, are at a higher risk of precocious puberty (Steingraber, 2007). While poor health and environmental stress is linked with delayed puberty, psychological stress can have the opposite effect and has been linked to earlier ages at menarche. This stress can include factors like single parent homes, poor father-daughter relationships, along with lower levels of parental income and education. These stressors are different from acute events which do not trigger early menarche (Walvoord, 2010). External

stress may be responsible for the difference in age at menarche observed between ethnicities, migrant communities and socioeconomic groups even within the same region (Kim, et al., 1997; Parent, et al., 2003; Rickard, et al., 2014).

The degree to which chronic diseases influence pubertal timing varies by type of disease and a number of individual factors such as age at onset and severity. For young children who acquire chronic diseases the likelihood if pubertal timing being influenced is greater than those who are already close to puberty at onset. A similar pattern emerges for severity, with more severe cases more likely to influence pubertal timing (Pozo & Argente, 2002).

#### *4.2.3.1 Vitamin D deficiency*

Vitamin D, a hormone, controls levels of blood calcium and influences the immune system. Vitamin D2 is found in foods such as cheese, eggs, fatty fish and liver and D3 is acquired through exposure of skin to sunlight. A deficiency in either can influence a range of functions including metabolic syndrome, autoimmune diseases and cancer rates along with pubertal timing and skeletal development. When the body does not receive enough Vitamin D in early childhood it can result in rickets and osteomalacia (Lewis, 2013; Lewis, 2010; Mays, et al., 2006; Hardy, 2003). Recent clinical studies suggest that vitamin D can influence pubertal development as low vitamin D levels have been linked to precocious or early onset puberty with some girls beginning menstruation before the age of 8, or in modern populations 2-5 years earlier than expected (Lee, et al., 2014). Vitamin D3 plays a particularly important role in puberty by influencing the regulation of the neurohormonal system which controls physiological growth and development (Chaykivska, 2015). In the spine and pelvis, rickets or osteomalacia, can result in thoracic kyphosis, a sacral promontory which is pushed forward causing the acetabulum to lift upward or inward which can later result in problems during vaginal childbirth (Aufderheide & Rodriguez-Martin, 1995).

#### *4.2.3.2 Vitamin C (L-Ascorbic Acid) deficiency*

Scurvy is the result of vitamin C or ascorbic acid deficiency caused by the inability to access fruits and some vegetables over an extended period of time; however, recent clinical studies suggest it may have a genetic component (Delanghe, et al., 2011). As the deficiency continues to worsen the body reduces the ability to form collagen and can go on to affect eye health, result in DNA mutations, the inability for the body to self-regulate iron leading to fatigue, and it can interfere the formation and metabolizing of dopamine, serotonin and neuropeptides (Harrison & May, 2009; Delanghe, et al., 2011). Limited clinical trials suggest that in pregnant women, a deficiency can impair fetal development, resulting in reduced body, brain and placental weights, (Schjoldager, et al., 2015).

#### *4.2.3.3 Anaemia*

While iron deficiency due to dietary choices is the most commonly referenced type of anaemia in the world today (Leung & Chan, 2001), the disease can be grouped into two categories: haemolytic and dietary. Studies on those with haemolytic types of anaemia show that 37.5% (n=15) were delayed by nearly 2 years in terms of sexual development when compared to the expected stage of development based on their chronological age (Olambiwonnu, et al., 1975). Dietary anaemia is the result of an inadequate diet or nutrition, decreased absorption of iron or an underlying condition such as chronic blood loss from parasites, menstruation, or ulcers. In puberty girls are particularly susceptible to iron deficiency related complications because it is most prevalent during periods of rapid body growth, which occurs during the pubertal growth spurt (Leung & Chan, 2001). This is due to the expansion of total blood volume, lean body mass and beginning of menarche. In fact, iron needs can more than double between prepubescent levels and the demands for menstruating adolescents on top of demands caused by rapid growth, resulting in high rates of iron deficiency among girls during puberty and in the years after. Iron deficiencies developed during this period can go on to influence pregnancy as girls are unable to replenish iron stores during these years (Beard, 2000; Ilich-Ernst, et al., 1998).

The skeletal effects of anaemia occur due to the body attempting to reabsorb bone for production of red blood cells. Porotic hyperostosis affects the bones of the cranial vault and is diagnosed by localized areas of porous bone tissue or lesions on the frontal and parietal bones, and less frequently the occipital bone. Due to the expanded diploic layer the areas appear thickened and the trabeculae becomes visible (Aufderheide & Rodriguez-Martin, 1995). Located in the orbital roof, cribra orbitalia consists of micro and macro pitting in the early stages followed by the "coral-like" appearance similar to porotic hyperostosis in the latter stages with outgrowth in extreme cases (White & Folkens, 2005). Structural changes are thought to be associated with age, and therefore, distribution is related to the changes from red to yellow bone marrow which occurs in individuals under the 30 years of age (Brickley, 2018; Mays, 2018).

#### *4.2.3.4 Endocrine disorders*

The endocrine system is responsible for triggering the hormones associated with pubertal growth spurt and timing, this includes oestradiol, growth hormones, androstenedione in girls (Delemarre-van de Waal & Rotteveel, 2001). Therefore, any disorder associated with the pituitary gland such as gigantism or thalassemia can influence pubertal timing since cartilage requires hormone stimulation for growth and growth hormones are related to pubertal timing (Cohen, 1938). Endocrine disorders, such as thalassemia, can be difficult to assess through the

skeletal remains of past populations as conditions were not survivable past childhood without modern medical intervention (Lewis, 2012). However, conditions including gigantism or dwarfism leave lasting skeletal changes and are potentially survivable without medical intervention. It can also be secondary to more common diseases such as tuberculous meningitis which causes damage to the pituitary gland (Cox & Mays, 2000). During puberty, it is the disruption of normal growth or production of growth related hormones which influence pubertal timing.

#### *4.2.3.5 Pathologies and health issues associated with menarche*

The onset, regularity and related complications such as dysmenorrhea associated with menarche can stem from a range of factors including hormonal abnormalities, autoimmune diseases, genetic mutations, psychological distress and pathological conditions such as tuberculosis. Although many of these, including polycystic ovary syndrome (PCOS) and Turner's syndrome, are not visible on skeletal remains it is possible to identify other pathological conditions on the skeleton which have been proven statistically significant in relation to menstrual conditions (Hickey & Balen, 2003). In the case of pulmonary tuberculosis, 66% of women report menstrual abnormalities including amenorrhea (n=112; 26.5%) and hypomenorrhea (n=86; 20%) in addition to fertility complications (Hassan & Darwish, 2010). In archaeological populations, a clear connection was made between tuberculosis and pubertal timing (Lewis, et al., 2016b)

Furthermore, women who begin menstruation at an earlier age have been shown to be at risk for hypertension, incident cardiovascular disease, incident coronary heart disease and cancer (Lakshman, et al., 2009). While rates of depression rise much faster in girls experiencing puberty than in boys (Angold & Worthman, 1993), particularly after the transition to Tanner Stage III and above regardless of age (Angold, et al., 1998). However, girls who reach puberty at an early age are more likely to develop depression or depressive symptoms (Galvao, et al., 2014). Negative menstrual experiences including irregular cycles or precocious puberty can influence menstrual attitudes and result in other women's health issues (McPherson & Korfine, 2004). Therefore, understanding pubertal timing and examining potential pathological conditions related to negative menstrual experiences can result in a deeper understanding of women in past populations.

##### 4.2.3.5.1 Body Mass and Body Mass Index

While nutritional deficiencies, such as anaemia, have long been associated with menarche a girls' body mass also plays an important role in regular menstrual cycles. While underweight adults or those with low body fat percentages such as athletes can briefly stop menstruating, in adolescent girls with a BMI of 25.0-29.9 were found to have irregular cycles known as

oligomenorrhea (Dars, et al., 2014). However, a higher (25.0-29.9) or lower (<18.5) BMI than average (18.5-24.9) can also result in polymenorrhea, a cycle shorter than 21 days and hypomenorrhea, having both light and infrequent menstruation (Thapa & Shrestha, 2015). Although in adult females' dysmenorrhea, menstrual cramps, are associated with both low and high BMI values (Ju, et al., 2015) , this has not been shown to be related to BMI in adolescent girls despite 78.6% (n=199/253) reporting it (Thapa & Shrestha, 2015).

### *4.2.4 Pubertal Timing in Modern Populations*

Modern populations display a wide range of pubertal timing due to variations in diet, genetics and overall health (Parent, et al., 2003; Karlberg, 2002; Gluckman & Hanson, 2006). Recent epidemiologic studies have shown that in many countries the age of puberty, including menarche has fallen due to better diets and health (Walvoord, 2010). In the United States, like many other developed countries, the average age at menarche has fallen during the last generation and is currently 12.54 years of age (Andersen, et al., 2012). Although based on a localized population in Mharashtra, India, a study of 742 girls between 9 and 16 years of age found that the mean age of menarche was 12.62 +/- 1.05 years (Rokade & Mane, 2009); whereas in Gangtock, Sikkim, India, an area comprised primarily of migrants girls reached menarche at 13.64 years (+/- 1.58 years) (Pandey & Pradhan, 2017). This is similar to Canada where girls reached menarche at mean age of 12.72 years (+/- 1.05 years) (Al-Sahab, et al., 2010). Whereas in Belgium, Flemish girls are slightly older, reaching menarche at 13.20 (+/- 0.20 years) (Wellens, et al., 1990). However, Gluckman (2006) argues that the earlier age at menarche experienced in modern populations actually matches that of the Neolithic period. Based on genetic evidence of MKRN3 gene (Hughes, 2013) and the understanding that during the Neolithic period social and physical maturity synced between the ages of 11 and 13 years of age for girl. Additionally, the pubertal growth spurt, which is closely linked to menarche, began in humans roughly 500,000 years ago as a way to optimise brain development over size. Overtime, pubertal timing was influenced by poor nutrition and environmental stress after the Neolithic Revolution which raised the age at which girls began menstruation (Gluckman & Hanson, 2006). However, there is no written evidence or skeletal development studies which have been completed to determine the age at menarche during the Neolithic period.

Among modern populations there is a range of ages at which girls begin menarche based on a combination of environmental, genetic and health related influences (Parent, et al., 2003; Karlberg, 2002; Gluckman & Hanson, 2006).. The reduction in age during the 20$^{th}$ and 21$^{st}$ centuries stems from infection and malnutrition having a reduced impact and, therefore, girls achieving optimum growth and development. The resulting fall in ages is now pulling physical and social maturity out of sync in developed countries (Gluckman & Hanson, 2006). As age at

menarche is correlated to age at first intercourse and first pregnancy, in modern populations, girls who experienced early menarche are more than twice as likely to have intercourse by 16 than those with late menarche and nearly twice as likely to become pregnant by 18 years of age (Udry, 1979).

### *4.2.5 Pubertal Timing in Archaeological Populations*

Until recently, understanding puberty in past populations has relied on ethnographic studies or primary written sources on ancient societies. For much of recent history there has been a strong correlation between childhood health and the age of menarche with evidence of delayed puberty among children with poor nutrition, migration and evolutionary adaptive mechanisms (Gluckman & Hanson, 2006). However, it was only with the development of a new method for determining puberty status based on specific skeletal markers in both male and female remains that accurate puberty information has been obtained from past populations (Shapland & Lewis, 2013; Shapland & Lewis, 2014; Lewis, et al., 2015).

A study by Arthur et al. (2016), that applied published methods for determining pubertal timing from skeletal markers (Shapland & Lewis, 2013) on 38 individuals, determined women living in Roman-Britain reached pubertal stage two by 10 years of age and the majority (n=7/8) of 10 to 12-year old females presented in the acceleration stage. Based on attainment of PHV but prior to fusion of the phalangeal epiphysis, menarche in Romano British women began between 15 and 17 years of age as all females under 15 years of age were in PHV while all females above 17 years of age were found to be in at least the deceleration phase. However, the sample of individuals used in this study is quite small (n= 38) including both males and females. By limiting the study to individuals aged 8 to 20 years, there is no room for women who were delayed as all females reached the deceleration phase by 18 years of age which does not likely represent Romano-British women.

Bioarchaeological studies show that in medieval England girls began puberty between 10 and 12 years of age, with PHV occurring by 14 and women having their first menses between 15 and 16 years of age; however, this was shown to be delayed for girls living in medieval London who did not have their first menses until the age of 17 due to the poor urban lifestyle (Lewis, et al., 2015; Shapland, et al., 2015). The largest of previous studies examining puberty the work of Lewis and Shapland showed the range of timings between rural and urban women, alongside the extended development which occurred in highly stressed populations.

A study of adolescence from the San Nicolás Maqbara, a cemetery site in Spain that dates from the 11$^{th}$ to 13$^{th}$ century showed that although menarche occurred between 16 and 17 years of age, individuals began puberty and progressed through the various stages at a wide range of

ages including a 9 year old which presented with a hamate hook suggesting they had reached PHV prior to death. This suggested the pubertal growth spurt began much earlier, around 10 years of age on average for girls in this region of Spain (Doe, et al., 2017). Similar to previous studies, the number of individuals included within the study who were females and assigned an age based on mandibular dentition is concerning (n=21) as when divided into the various puberty stages the numbers of individuals are quite small. This is likely the reason behind the author's suggestion that the pubertal growth spurt occurred around 10 years of age for girls (n=2).

Owing to the relative recent publication of the method, the number of osteological studies conducted on females remains limited. However, it is a key transition in female development which has wide ranging implications, both social and physical. The age at which a female begins menstruation influences the length of her reproductive period and intern the potential number of pregnancies possible. Socially, in many ancient societies it marked the beginning of a transition period between girlhood and adulthood. While it is unlikely girls were married simply because they had begun menstruating the social impact of entering adulthood would have changed her role within the family and wider society.

## 4.3 Pregnancy

Risks associated with childbirth are often blamed for the high rates of females included among archaeological populations (Trevathan, 2010; Pfeiffer, et al., 2014). During pregnancy and childbirth both the woman and fetus are at risk of death from various complications. These complications have remained similar across geographical regions and time periods. It is estimated that over 300,000 women worldwide died from complications related to childbirth in 2015. The majority of deaths stemmed from severe bleeding, infections, high blood pressure and unsafe abortions (World Health Organization, 2016). These complications account for approximately 80% of maternal deaths in childbirth worldwide. Most importantly, 99% of all modern maternal deaths occur in developing countries (World Health Organization, 2014) suggesting they faced similar complications leading to comparable death rates in ancient societies. Unfortunately, the complications listed in medical records are not visible on skeletal remains making it difficult to determine their impact on maternal or fetal death in past populations. However, 20% of maternal deaths stem from complications which are able to be observed on skeletal remains, such as obstetric dilemmas caused by cephalopelvic disproportion. Cephalopelvic disproportion or CPD occurs when a fetus is too large for the woman's pelvis this can occur when a fetus with a large head or shoulders w prevents passage through the birth canal or when the female has a pelvis which is too small to allow the fetus to pass through. CPD occurs when there is a mismatch between the size of the fetus and the size of

the pelvis. Determining obstetric hazards such as CPD requires measuring the pelvic inlet, midplane and outlet. In modern populations, the dimensions of the pelvis are determined through a vaginal exam. The inlet is measured by inserting the index and middle fingers, in an attempt to reach the sacral promontory for the pelvic inlet, and then moving them along the pelvic brim or midplane (Cunningham, et al., 2010). If it is possible to reach the sacral promontory or the accurate line, then it is likely that the pelvis is contracted (Figure 15). Lastly, the intertubuerous diameter or outlet is measured using the '4-knuckle rule' which requires making a fist and placing the knuckles underneath the pubic symphysis (Figure 16).
When discussing obstetrics there are a series of key terms including:

- **Obstetric Dilemma**- Refers to the opposing evolutionary forces of bipedalism (walking upright on two legs) and large brained neonates.
- **Developmental Obstetric Disorder (DOJ)**- Refers to the pelvis changing shape due to changing obstetric needs throughout the female life course.
- **Cephalopelvic Disorder (CPD)**- Occurs when the foetus is unable to fit into or through the pelvis and vaginal birth becomes impossible.
- **Contracted Pelvis**- A pelvis in which one or more of its diameters is reduced so that it interferes with the normal mechanism of labour.

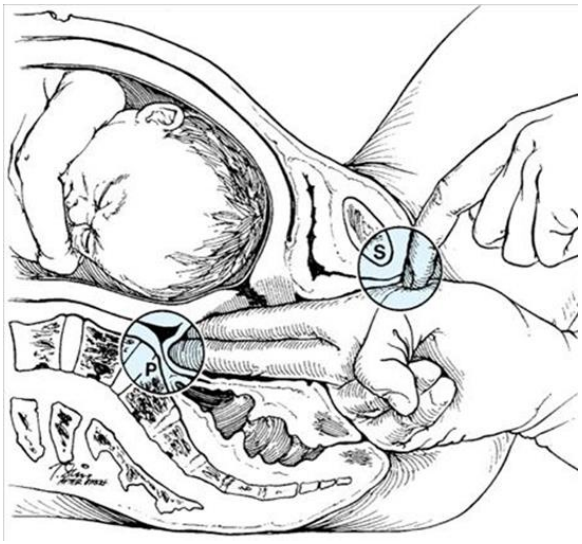



*Figure 15. Vaginal exam for a contracted pelvis. P is the sacral promontory and S is the pubic symphysis (From Cunningham et al., 2010).*

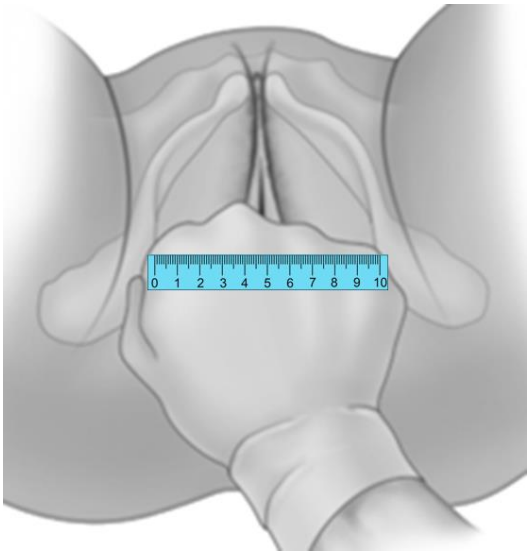



*Figure 16. External measurement of the intertuberous diameter, demonstrating the '4 knuckle rule'.*

### *4.3.1 Fetal development and associated risks*

While the gestation for each pregnancy can vary by up to five weeks, due to factors such as the mother's age, the mean length of gestation is 268 days or just over 38 weeks from the date of the woman's last menstrual period (Jukic, et al., 2013). In modern populations, fetal development is monitored through ultrasounds. This is particularly important as fetal growth restriction is the largest category associated with stillbirths and other unexplained poor birth outcomes (Gardosi, 2005). However, in the past women would have relied on other signals such as the quickening, which occurs when a woman first feels the fetus move, to signify fetal development. Pregnancies would have been monitored a through external measurements , such as size through monitoring Fundal height or symptoms associated with pregnancy, cramping or back pain, and breast size (Cunningham, et al., 2010).

#### *4.3.1.1 First Trimester (Weeks 1-12)*

During the first trimester, the fetus is within the early stages of placental development which centres on the amnion, yolk sac and germ disk in relation to the large fluid-filled space of the exocoelomic cavity (Bhattacharya & Stubblefield, 2016). While this cavity can be viewed via a transvaginal probe by the 5$^{th}$ week of menstrual age, it continues to grow until the 11$^{th}$ week of pregnancy. Additionally, the placenta establishes access to the maternal circulatory system to provide a blood supply for the fetus (Figure 17). A potential complication occurs during this development when the extravillous cytotrophoblasts, an intermediate type of stem cell linking the mother and fetus, are responsible for entering the uterus and transforming the spiral arteries into large blood vessels with low resistance (Coad & Dunstall, 2011). If the trophoblasts, which link the fetus to the mother, are unsuccessful in entering the uterus or transforming the blood vessels it can result in preeclampsia or fetal growth restriction due to poor placental function (Lyall, et al., 2001). Additionally, if the trophoblast cells are excessive in their invasion of the uterus the result can be complete erosion of the endometrium leading to *placenta accreta,* which occurs when the placenta deeply imbeds itself into the uterine wall leaving part or all of the placenta behind after childbirth potentially resulting in an increased risk of postpartum haemorrhaging. A reduced invasion of trophoblast cells also has potential complications for the mother including chromosomal anomalies, a clotting condition known as thrombophilia, and endometrial dysfunction. Due to the important nature of establishing a connection with the maternal blood supply, these types of issues are responsible for the cause of 67% of spontaneous miscarriages at this point in gestation (Jauniaux, et al., 2006).

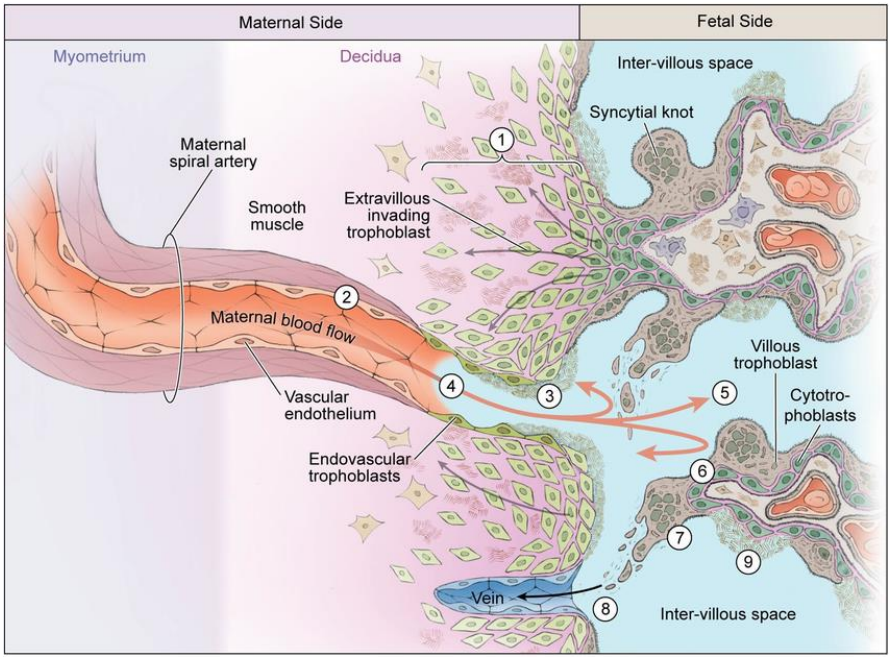



*Figure 17. Uteroplacental vascular insufficiency. Extravillous cytotrophoblasts are less successful in invading the maternal decidua and may be removed by the maternal immune system (1). Consequently, the distal spiral arteries are narrower (2) and diseased, accompanied by atherosis or local fibrin deposition (3) and reduced endovascular invasion (4). Hypoxia or hypoxia-reoxygenation injury (5) has direct effects on the villous trophoblast compartment, reducing syncytial fusion (6) that may trigger the formation of syncytial knots (7). These accumulate but may fragment and shed into maternal blood (8), whereas areas deficient in syncytial fusion may exhibit focal necrosis (9) (from Kingdom and Drewlo, 2011).*

#### *4.3.1.2 Second Trimester (Weeks 13-27)*

Unlike the first trimester which focused on changes within the womb in preparation of fetal development, the second trimester is marked by numerous developmental milestones for the fetus. The probability of a miscarriage drops significantly with only 1-5% of pregnancies lost between 13 and 19 weeks. This falls even further to 0.03% in weeks 20-27 (Michels, 2007). Early in the second trimester the fetus develops intestines, sexual organs, and the previously cartilaginous skeleton begins to ossify. By the end of the phase, the brain develops allowing the fetus to respond to sound. The fetus also becomes covered in lanugo, a fine downy hair and secretions to protect the skin from the amniotic fluid. Typically, the fetus begins week 13 or 14 at around 90 millimetres and 40 grams; however, by week 27 the fetus soars to 230 millimetres and can weigh up to 820 grams. This extreme growth can have a negative impact on the cervix leading to cervical incompetence or insufficiency (Bhattacharya & Stubblefield, 2016). As it is the cervix which bears the brunt of the fetus' weight, at times it is unable to withstand the pressure of the growing fetus resulting in an asymptomatic dilation or rupture of the internal cervical os, dilation of the cervical canal and eventually premature delivery (Lobo, et al., 2016). An important occasion, in this phase is the 'quickening', a moment when the mother first feels movements within the uterus. In historical populations, as with modern least economically developed countries (LEDCs), this moment serves as confirmation of pregnancy (Weir, 2006;

McClive, 2002). Fetal movement is important as it is used throughout the pregnancy to monitor the health of the fetus and is often one of the first signs, aside from vaginal bleeding, of potential complications. Autoimmune diseases such as systemic lupus erythematosus can cause hypertension, while thyroiditis or hypothyroidism and hyperthyroidism can present for the first-time during pregnancy resulting in preterm birth and, if untreated, death (Adams Waldorf & Nelson, 2008). Other risks which present during this time and are responsible for the majority of miscarriages are chromosomal abnormalities, thrombophilia and maternal infection including viruses and fungi (Michels, 2007).

#### *4.3.1.3 Third Trimester (Weeks 28-40)*

While physically the fetus seems fully developed, the central nervous system continues to mature. The fetus begins preparing for the birthing process by gaining around 230 grams a week, practicing breathing and detecting changes in light with its eyes. As the fetus continues to grow, there is an increased risk in cervical incompetence which can also be linked to multiple pregnancies in quick succession. During the final weeks, the placenta transfers antibodies to the fetus in preparation for delivery and Braxton Hicks contractions may begin. By 35 weeks it is possible to successfully give birth to a viable neonate (Coad & Dunstall, 2011). It is also around this time the head might start to descend into the pelvis. By this point, the fetus is occupying the majority of available space and moving on a regular basis. This can result in abnormal torsion or prolapse, compression and thrombosis of the umbilical cord leading to an obstruction in the flow of blood in umbilical cord vessels, causing acute placental insufficiency and sudden fetal death (Bring, et al., 2013). Additionally, stillbirths can still occur due to chromosomal abnormalities, abnormal growth patterns or from conditions developed during the pregnancy such as preeclampsia or placenta praevia. The long-term effects of nutritional deficiencies such as vitamin D (Merewood, et al., 2009) or alcohol abuse can also result in stillbirths (Andersen, et al., 2012).

## 4.4 Mechanism of Labour

There are three main stages of childbirth: latent and active labour, pushing or expulsion, and delivery of the placenta. The first stage is characterized by the onset of contractions resulting in changes to the cervix and is subdivided by the speed in which the cervix dilates. It is during the latent phase in which the cervix beings to soften, while during the active phase dilation accelerates, ending when the cervix is fully dilated. Although it is the slowest moving of all three phases, it is possible for women to reach full dilation in under an hour. Those who have previously given birth vaginally tend to move through latent and active phases quicker than those women bearing their first child. However, there are several potential complications which can occur during labour putting both the mother and fetus in peril (Cunningham, et al., 2010). Even in modern hospital births, studies show that up to 36% of women suffer from obstetric

haemorrhaging, neonatal depression, fetal heart rate concerns or first stage arrest- the latter of which require caesarean delivery (Hamilton, et al., 2016).

### *4.4.1 First stage- Latent and Active Labour*

The longest of the stages, the first stage is further subdivided into two phases based on cervical dilation, the latent phase (0-3cm) and active phase (3-10cm). Typical signs of first stage labour are those many people are familiar with such as early contractions or 'water breaking'. However, it is the latent phase during which the cervix softens, resulting in the membranes rupturing during the following active phase and the beginning of effacement, or the fetal head descending into the pelvis. This is completed during the active phase. While every birth is different, and the length of time for the cervix to dilate varies from hours to days (Hamilton, et al., 2016), once active phase is reached all but 2.8% of modern pregnancies are delivered within 12 hours (Impey, et al., 2000). This is a potentially high-risk period in labour as the complications which can arise during phase can stem from the mother or the fetus. If the mother suffers from fibroids or cervical stenosis it can result in cephalopelvic disorder (CPD). At this point it is the mother's pelvic inlet which determines if the fetus will continue to descend towards a vaginal birth. The fetus may not descend correctly if is malpresented, this occurs when the fetus is not head down but instead transverse or breech. If malpresentation is caught prior to the infant entering the pelvis it can be possible to shift the fetus through manipulation allowing it to pass head first into the birth canal (Cunningham, et al., 2010).

If the mother is in a weakened condition, she may present with a primary uterine inertia or a prolonged labour lasting more than 48 hours. This results in the inability to contract the uterus with enough force to proceed through the birth stages (MacRae, 1948) . Additional causes include the cervix not dilating or effacing while the fetus may not rotate or descend properly. This can occur if the fetus is malpresented, for example, in cases of twins or primiparas. An example of malpresentation resulting in prolonged labour occurring is if the fetus is in an occiput posterior position or facing the wrong way. Aside from a painful lengthy labour, in extreme cases this can result in tearing of the birth canal (Cunningham, et al., 2010). Once the causes for primary uterine inertia or prolonged labour are determined the first approach is to keep the mother actively moving during the first hours of labour or manipulate the fetus into the appropriate birthing position to encourage a spontaneous delivery. If this fails the causes are addressed through medical intervention such as repositioning of the fetus by forceps or forcible stretching of the cervix, again with the aim of a spontaneous delivery (Gherman, et al., 1997). In the case of dystocia, a caesarean section is used as a last resort and if left untreated there is a high possibility of sepsis after 72 hours (Stern, et al., 1948). Other complications such as fistulas can develop after birth. In cases where the labour is progressing normally, once the

cervix is dilated to between 7cm and 10cm with contractions averaging 3 minutes apart, the fetal head descends into the pelvic inlet the labour process moves into the second stage (Cunningham, et al., 2010).

### *4.4.2 Second stage- Pushing or Expulsion*

During the second stage the fetus passes through the birth canal and exits the vaginal opening. As the fetus descends the head flexes along the spine as the entire body internally rotates until the head is facing the maternal spine and level with the ischial spines. Next the head extends around the pubic symphysis until it reaches the vaginal opening. At this point, the fetus must rotate back to shoulders being anteroposterior which allows for the anterior shoulder followed by the rest of the body to exit the vaginal opening (Cunningham, et al., 2010). Dystocia, or difficulty in labour, can take place for a variety of reasons including a secondary uterine inertia if the fetus has remained malpresented included incomplete rotation resulting in failure to progress. While prolonged labour in modern hospitals can be overcome through caesarean sections, it also results in an increased risk of maternal morbidity in cases which relied upon surgical and non-surgical intervention (Cheng, et al., 2004). The mother's midpelvis measurements will determine if the pelvis is contracted and could prevent the fetus from passing through the opening causing fetal distress. Again, modern medical intervention may necessary in terms of forceps or an emergency caesarean section to assist with easing the fetus through the mid-pelvis or pelvic outlet and out of the vaginal opening. However, with the use of forceps comes the increased likelihood of trauma to the fetus (Murphy, et al., 2001). Other potential complications which can result in maternal or fetal distress include problems with the umbilical cord due to internal fetal rotation; umbilical cord prolapse or compression, and loss of fetal blood supply. These could contribute to fetal death rates of up to 50% without surgical intervention (Boyle & Katz, 2005). Once the fetus exits the vaginal opening the mother moves into the third and final stage of delivery.

### *4.4.3 Third stage- Delivery of the Placenta*

The placenta, which previously provided nutrients and oxygen to the fetus, must be discharged once the fetus is no longer in the womb. Although the hazards associated with the fetus during the delivery have passed as this stage takes place up to 30 minutes after the birth of the infant, is also a period of potential risk to the mother (Cunningham, et al., 2010). Often signalled by a gush of blood, the woman's body responds with haemostasis to quickly clot and stop the inter-uterine bleeding. However, post-partum haemorrhaging can occur within 24 hours due to trauma during birth, or days later if a blood clot or tissue is left behind. A retained placenta can lead to haemorrhaging if it adheres to the uterine wall or detaches from the uterus but becomes trapped inside the uterus by the cervix. As with earlier stages in pregnancy, *placenta accreta*

occurs when the placenta is attached to the muscular layer of the uterine wall. If removed this could create uncontrolled internal bleeding resulting in maternal death on many occasions without modern medical intervention (Bretelle, et al., 2007). A retained placenta, particularly *placenta accreta*, is more likely to occur in women over 35 years of age or those who previously experienced a retained placenta (Miller, et al., 1997). This makes death as a result from a retained placenta more likely to occur in women after their first pregnancy. Aside from blood loss, if the placenta is not fully removed from the uterus, sepsis can set in and result in death. It is possible to remove the placenta by hand; however, this also carries the increased possibility of infection since it requires reaching into the uterus to scrape the remaining lining attached to the uterine wall (Rosenberg, et al., 2011). If the woman succumbs to death during the final stage of childbirth the infant is at an increased risk of death from a range of factors, including lack of nutrition, or the inability for family members to cope with the increased demands of a new infant (World Health Organization, 2015).

### *4.4.4 Pelvis Typologies*

In archaeological populations, complications in childbirth are often thought to occur due to the evolutionary demands of bipedal locomotion and birth of large-brained infants (Rosenberg & Trevathan, 1995; 2002). The study of pelvis shape and structure began in the early 19$^{th}$ century and was closely linked to racial anthropology and anthropometry (Greulich, et al., 1939; Bolk, 1929; Turner, 1885). A pioneer of pelvic typology, Weber (1830), described four forms of the pelvis, based on visual observations which he labelled oval, round, four-sided and wedge-shaped. In an oval pelvis, the transverse diameter of the brim is longer than the conjugate resulting in an oval shape. The round pelvis had nearly identical measurements for the transverse and conjugate, while the four-sided pelvis had a transverse which exceeded the conjugate, but the boundaries of the pelvic brim were flattened. Lastly, in the wedge-shaped pelvis the inlet is laterally compressed with the transverse diameter compressed particularly near the pubic symphysis resulting in a longer transverse diameter. As these classifications were determined by visual observations it made it difficult for others to refer to a common standard (Turner, 1885). In an attempt to move away from visual observations, Zaaijer (1866) took a series of measurements from the inlet, midplane, and outlet in order to develop a computational standard. The result was by taking the transverse diameter Zaaijer (1866) created the 'pelvic index' based on the measurements obtained from the pelvic brim which he then used to explain the variety of pelvic shapes found within women of the same race. Out of these early studies 4 pelvic typologies were established: gynaecoid, anthropoid, android and platypelloid (Figure 18).

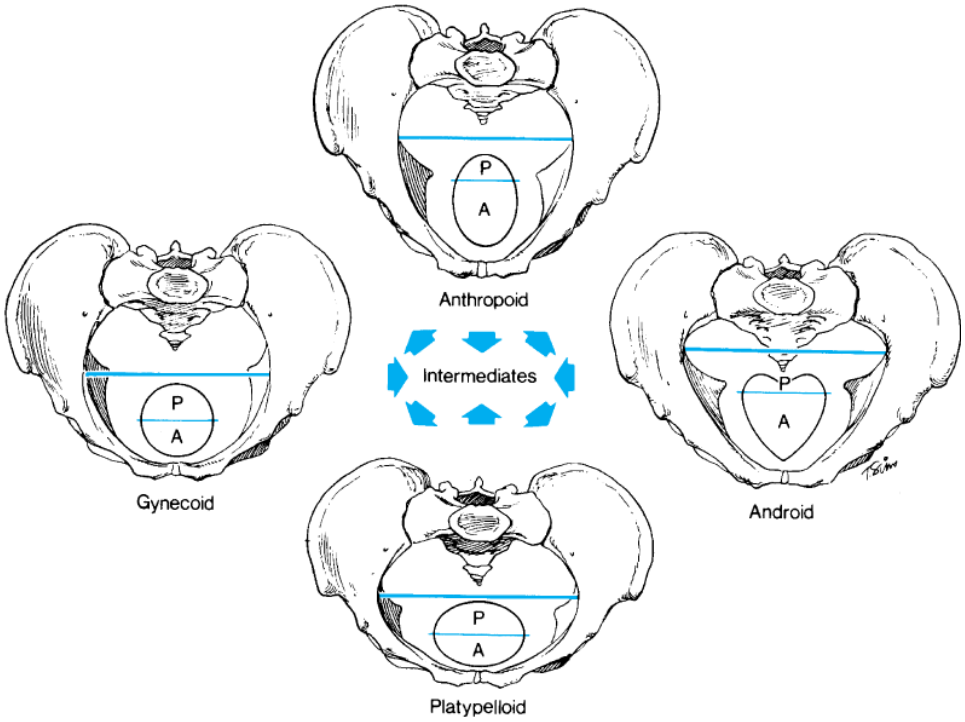



*Figure 18. Four pelvic typologies as developed by Caldwell and Moloy (1933; 1938). From Williams Obstetrics (Cunningham, et al., 2010, p. 63), where A is the anterior space and P is the posterior space in relation to the widest point of the inlet.*

Deemed the most adapted of all the pelvis types for birth, the gynaecoid shape consists of a round pelvic or transverse oval inlet with a shallow pelvic cavity (Caldwell & Maloy, 1933). As it is best suited for labour, nearly 50% of females present with this pelvis shape making it the most common among the four typologies. The pelvic cavity is increased by short ischial spines making for a short birth canal and quick birth. In cases where a fetus presents with persistent occiput posterior position (POP), unlike the other pelvis shapes the gynaecoid pelvis is often large enough to accommodate a fetus during a delivery in which the fetus remains facing the pubis (Cunningham, et al., 2010).

An anthropoid pelvis has a slightly different shape, consisting of an oval inlet due to larger anteroposterior measurements when compared to a small transverse diameter. Although it has a large pelvic outlet, the inlet is often contracted and can result in improper engagement of the fetal head, with an occiput posterior position instead of the desired occiput anterior (Caldwell & Maloy, 1933). The complications which can occur from this includes a prolonged labour and extended pregnancy (Cunningham, et al., 2010).

An android shaped pelvis was initially associated with males as it has a small triangular inlet. While the sidewalls create a funnel shape with a flat sacrum often rotated slightly forward creating a ‘heart’ shape, the narrow transverse outlet diameter and prominent ischial spines can

make childbirth difficult (Caldwell & Maloy, 1933). Of the four typologies, the android shape has the narrowest subpubic arch which can create difficultly when relying on the subpubic arch angle to assign sex.

The platypelloid shape has a narrow anteroposterior diameter of the pelvic inlet creating a shallow pelvis suitable for childbirth (Caldwell & Maloy, 1933). However, the overall shape can make it difficult for the fetal head to engage correctly as it enters the pelvis, instead undergoing anterior rotation lower than expected resulting in dystocia or cephalopelvic disproportion. Due to difficulties in labour only a small percentage, 5% of women present with this shape (Cunningham, et al., 2010).

While studies debate the accuracy of the 4 typologies (Kuliukas, et al., 2015; Walrath, 2003), however, metric analysis of 172 female CT scans to measure the anteroposterior and transverse diameters of the pelvic inlet and midplane show a series of clusters representing three of the traditional classifications; gynaecoid, 'narrow' and intermediate (Kolesova & Vētra, 2012). The slight discrepancy of their findings when compared to the traditional four typology model (Caldwell & Maloy, 1933) could be due to the homogenous nature of the study participants as it was conducted on women from a single area in Latvia. When divided into age categories, data showed a trend for younger females to have narrower pelvises and this closely relates to an increase in Caesarean sections in the last few decades (Kolesova & Vētra, 2012). Again, this could explain the discrepancies between the Latvian CT scan study (Kolesova & Vētra, 2012) and the original publication of pelvis typologies (Caldwell & Maloy, 1933).

### *4.4.5 Visibility in the Archaeological Record*

Evidence for obstetric deaths in the archaeological record is very rare. Double graves do not automatically infer a relationship between the infant and woman, much less her death in childbirth. The association between obstetric dilemmas and death in childbirth among past populations most likely stems from doctors during the Victorian period in which women stuffed from malformed pelvises due to childhood vitamin D deficiency and poor hygiene in early hospitals which caused childbirth to be quite hazardous (Wells, 1975). However, there are examples from around the world of women who likely died in childbirth due to a variety of complications (Cruz & Codinha, 2010; Arriaza, et al., 1988; Lieverse, et al., 2015; Malgosa, et al., 2004; Högberg, et al., 2008). Much of the recently published literature on past populations has focused on the fetus verses the mother. One of the primary problems is the nature of fetal or neonate remains being excavated, examined and published. For instance, there are over 20 cases of unpublished but excavated neonates from Britain alone (Roberts & Cox, 2003). Additionally, determining the gestational age of a neonate is complicated (Halcrow, et al., 2018). Ageing

methods are frequently done through measuring long bone lengths, however, it is difficult to take into account premature birth, the neonate growth spurt and differences between the sexes (Shih, et al., 2005; Chitty & Altman, 2003; Scheuer & Black, 2000; Ubelaker, 2005).

Pre-Columbian Indians in Chile are known for mummifying members of their society in the dry, desert conditions which exist in caves around Arica. The 187 autopsied mummies provide a unique glimpse into pregnancy and childbirth in past population as the soft tissue has been preserved which allows for a more thorough investigation. Among those autopsied, 14% (n=18) were determined to have died from childbirth related complications primarily during puerperium, such as dislocation of the pubic symphysis, sacroiliac separation and pneumonia. Of these 18, three were determined as to have died without complete delivery including complications arising from a breech birth and a set of twins (Arriaza, et al., 1988).

Determining the rate of obstetric hazards based on skeletal remains is much more difficult. Death in childbirth is only certain when the viable fetus remains within the pelvic cavity. Despite the rarity of finding an in-utero fetus, there are over twenty published cases, the oldest of which is a woman from the Early Neolithic period in Siberia. Aged between 20 and 25 years of age the woman was found with fetal remains in the abdominal and pelvic region, extending over the upper femur. Based on the minimum number of individuals (MNI) from skull and humeri it was determined that the woman was expecting twins which were between 36 and 40 weeks at death. One fetus was much larger than the other and was in breech position, with bottom down as it entered the pelvic canal. Due to its size the fetus became wedged and was far too large to be removed via a vaginal delivery even after the death of the mother. The first twin also effectively blocked the way for the second. However, despite knowing the mother died due to an obstetric dilemma it is unknown the specific cause of death as it could have included infection, haemorrhaging, or exhaustion due to the inability to deliver the larger fetus (Lieverse, et al., 2015). Exhaustion during delivery is common among breech births or women suffering from CPD because the uterine muscles continue to contract for hours or days. This can result in the uterus rupturing or no longer being able to contract, leading to sepsis and the death of the mother due to cardiac arrest (Cunningham, et al., 2010). Similar to the female mummy from Arica, Chile, a female aged approximately 25 years at death was excavated from a site dating to the Spanish Bronze Age and showed signs of pubic symphysis dysplasia with a rupture of the sacro-iliac joint. The fetus was located in the pelvic girdle in a transverse position with the right arm extended under the pubic symphysis and outside the uterus (Malgosa, et al., 2004). It is likely that the head of the fetus was offset due to the arm position and resulted in an obstetric dilemma as it was unable to manoeuvre through the pelvic outlet (Figure 19).

Overall health, along with physical morphology can contribute to obstetric dilemmas. This is likely the case of a young female, likely aged between 15 and 23 years at death based on epiphyseal fusion, pubic symphysis and auricular surface morphology. The female and full-term neonate were excavated from An Son, a large mound located near the Vam Co Don River in southern Vietnam. At 144.2-146.4cm, the female is considered at risk of a contracted pelvis due to her small stature. She also showed signs of developmental stress including changes including linear enamel hypoplasia, active cribra orbitalia and changes to the right sacral ala. The fetal remains were located in a Frank breech position (Figure 20), with the bottom down (Willis & Oxenham, 2011). Additionally, the female had an android shape pelvis which have been considered contracted by modern medical measurements (Cunningham, et al., 2010).

A contracted pelvis was also found among the 330 burials of adult females from medieval Stockholm in Sweden. Of the burials, three females were found buried with a fetus aged between 7.5 and 9.5 lunar months, including two in-utero. One female, no. 900, had a contracted pelvic inlet while no. 176 had morphological changes within the pelvis including posterior sacral facets. There is no mention within the excavation record of the in-utero fetuses being in breech position, only located within the birth canal (Högberg, et al., 2008).

While death in childbirth according to Wells (1975) involves in-situ remains, Ascádi & Nemeskéri (1970) suggest that death in childbirth can be concluded based on full-term neonates found in a joint burial. Within the Roman period, in-utero burials are rare; however, a female aged 40 years, was excavated from State Street in Baldock with three fetuses determined to be roughly 8 lunar months ( Figure 21). This is a unique case, as one fetus was located in the south-western corner of the grave, the second remained within the birth canal, and the third in the uterus. To ensure a familial relationship, DNA tests were conducted which concluded that all three fetuses were related to the woman found in the burial (North Hertfordshire Museum, 2018).

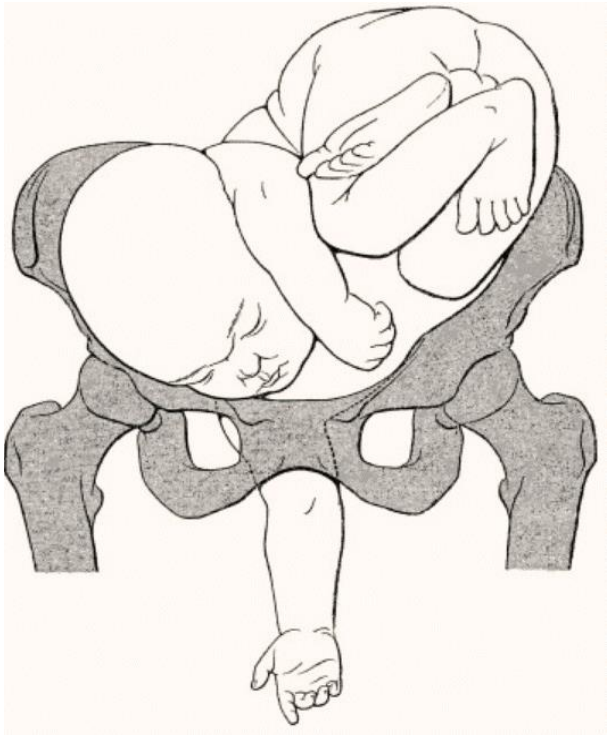


*Figure 19. Drawing of the position of fetus CV96MN-2, from Malgosa, et al., 2004.*

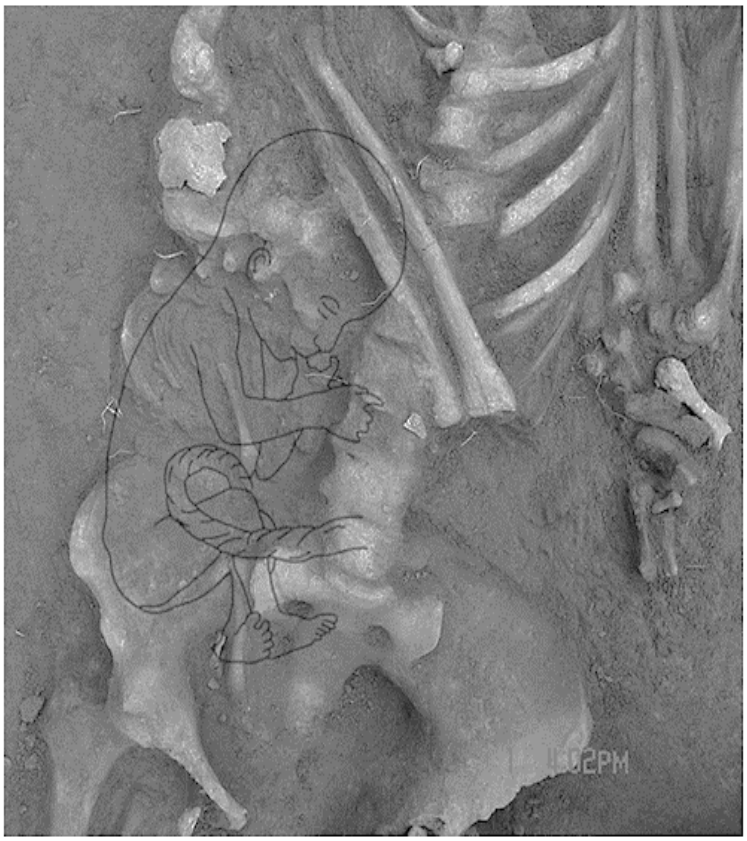


*Figure 20. Superimposed drawing of the position of fetus AS07H1M3b in-situ, from Willis & Oxenham, 2011.*


*Figure 21. Excavation of female from Baldock buried with 3 fetuses from North Hertfordshire, 2018.*

## 4.5 Conclusion

Female development, including pubertal timing, can be influenced by a range of factors including health and diet. Deficiencies and diseases are likely to impede development, although once health and diet improve, girls are likely to experience a period of rapid 'catch-up' growth and development. This can mask childhood stress in older populations including stress which may influence survival rates during pregnancy and childbirth. The age at which a girl experiences her first menses can also influence her mental health and ability to play an active role within society as a result of social isolation, leaving school, and a general misconnection between mental and physical development.

Only with recent publications has pubertal timing been explored within past populations, which has traditionally been determined from literary sources. The overall, trend shows that in past populations girls underwent puberty at an older age, including age at first menses but took longer to reach a level of physical development to regularly survive pregnancy. In modern and past populations, women faced and continue to face potential birth hazards or risks in pregnancy ranging from *placenta accreta* to haemorrhaging and fistulas. Throughout pregnancy

the mother and fetus can be influenced by genetic mutations, diseases, and a variety of other complications which also influence survivability. Although the high rates of female mortality during the prime reproductive period have been attributed to obstetric complications there are very few examples of this in the archaeological record, potentially due to the androcentric nature of early archaeology, and this needs to be addressed in further research.

# 5 MATERIALS AND METHODS

## 5.1 INTRODUCTION

A total of 23 sites were chosen from 1st-5th century Romano-British cemeteries located in Southern England with the aim of creating a wide distribution across the core urban centres of the Roman period (Figure 22 and Table 3). Females determined to be between the ages of 10.0 and 44.9 at death were examined. This resulted in a total of 436 individuals across 11 Romano-British urban centres in the south of England. Primary data collected from each individual included sex, age, stature, development of skeletal markers associated with pubertal timing and pelvic measurements from the inlet, midplane and outlet. Urban and semi-urban sites in the south of England were selected as they represented a population with close contact with Romans in the 1st and 2nd centuries and were located along major trade routes allowing for movement of goods and people. Throughout the period of occupation during the Roman period, the population and size of the settlements would have varied in size. Additionally, the published material on sites such as Poundbury Camp (Molleson, 1989; Farwell & Molleson, 1993; Lewis, 2009; Rohnbogner, 2015) and Lankhills (Booth, et al., 2010; Clark, et al., 1979) include discussions on health of the population while smaller sites such as Wendlebury Lane have limited published reference material on general health. To overcome this, separate excavation sites which were often located just outside the town boarders, were grouped by urban or semi-urban centres. Selection of sites was restricted by availability of remains due to lack of museum funding, closure to outside researchers or refurbishment. This resulted in the exclusion of individuals from the large Roman city of *Londinium*.

## 5.2 MATERIALS

Located throughout Southern England, the sites selected for this study are associated with urban centres including C*ivitas Capitals* and *Coloniae* (Burnham & Wacher, 1990; Wacher, 1975). The *Civitas Capitals* were towns that served as administrative centres for local government and most were associated with a particular tribe such as the *Belgae* in modern Winchester. In Roman Britain, the *coloniae* were built specifically for retired legionaries. As the majority of those living in the town were Roman citizens, these were the most influential. A reflection of the Roman way of life led to cities such as *Camulodunum*, modern Colchester, following Roman planning models with straight roads and the expected amenities of bathhouses, temples and a forum. It is important to note the range of 'urban' sites utilized within the study, which included small towns and small settlements, and likely fluctuated in size and population throughout the Roman period (Rogers, 2014; Wacher, 1975; Burnham & Wacher, 1990).

The majority of cemeteries associated with urban centres dating from the Romano-British period are found outside the city boundaries. Occurring both for cremation and inhumation burials this practice stems from the Roman religious beliefs around pollution. As the dead were considered polluted, Romans introduced laws to protect themselves both religiously and in the practical considerations of hygiene (Lindsay, 2000). Additionally, those who came into contact with the dead were considered polluted and were forced to abstain from making offerings until they underwent specific cleansing rituals (Livy, 2.8.7). As this contamination could occur by indirect contact, it was of upmost importance that the dead be placed outside the city. Therefore, when choosing cemetery sites for this study it was important to insure they were associated with a specific urban centre even though they lay outside the settlement boundaries. The number of individuals (n=436) is proportional to the size of sites associated with each urban centre. Although Durnovaria is represent by a single site, Poundbury Camp, it is the largest Romano-British cemetery site excavated to date. Additionally, poor preservation of individuals at specific sites such as Queensford Farm and Queensford Mill associated with Dorchester-on-Thames reduced the number of individuals available for study.


*Figure 22. Map showing distribution of sites used in study. Numbers correspond to Table 3.*

*Table 3. Table of archaeological sites used in study and related urban centre.*

| **Urban Centre (location on Figure 22)** | **Site Type** | **Number of Individuals** | **Percentage of Sample** |
|---|---|---|---|
| **Ancaster, Lincolnshire (1)** | ***Vicus*** | **34** | **7.8%** |
| • **Ancaster** | | 34 | |
| **Ashton, Northamptonshire (2)** | ***Vicus*** | **10** | **2.3%** |
| • **Ashton** | | 10 | |
| **Baldock, Hertfordshire (3)** | ***Vicus*** | **32** | **7.3%** |
| • **California** | | 16 | |
| • **Royston Road** | | 4 | |
| • **Sale Drive West** | | 5 | |
| • **Stane Street** | | 7 | |
| **Bicester, Oxfordshire (4)** | ***Vicus*** | **6** | **1.4%** |
| • **Wendlebury Lane** | | 6 | |
| **Cirencester, Gloucestershire (5)** | ***Civitas Capital*** | **39** | **8.9%** |
| • **Bath Gate** | | 17 | |
| • **Gambier Parry Lodge** | | 7 | |
| • **Kingsholm Drive** | | 15 | |
| **Colchester, Essex (6)** | ***Colonia*** | **62** | **14.2%** |
| • **Butt Road** | | 62 | |
| **Dorchester-on-Thames, Oxfordshire (7)** | ***Vicus*** | **30** | **6.9%** |
| • **Queensford Farm** | | 20 | |
| • **Queensford Mill** | | 5 | |
| • **Wittenham Lane** | | 5 | |
| **Dorchester, Dorset (8)** | ***Civitas Capital*** | **131** | **30.0%** |
| • **Poundbury Camp** | | 131 | |
| **Gloucester, Gloucestershire (9)** | ***Colonia*** | **6** | **1.4%** |
| • **London Road** | | 6 | |
| **Ilchester, Somerset (10)** | ***Vicus*** | **8** | **1.8%** |
| • **Little Spittle** | | 6 | |
| • **Townsend Close** | | 2 | |
| **Winchester, Hampshire (11)** | ***Civitas Capital*** | **78** | **17.9%** |
| • **Andover Road** | | 4 | |
| • **Lankhills** | | 52 | |
| • **St Martins Close** | | 4 | |
| • **Victoria Road** | | 18 | |
| **Total:** | | **436** | |

### *5.2.1 Cavsennae, Ancaster, Lincolnshire*

Founded in the late-1st century, alongside the larger *Lindensium* (Lincoln) located to the north, *Ancaster* served as a smaller town (*vicus*) which centred on military defences and overland trade due to its location between *Lindensium* and *Londinium*. Excavations between 1964 and 1973 uncovered evidence of an Iron Age settlement, Roman period defences and a related Late-Roman cemetery. Although evidence for occupation spans from the Iron Age through the Roman period it was during the 2nd century that the site underwent a rapid expansion. It was during this period that housing and other necessary buildings began to occupy areas beyond the

defences (Burnham & Wacher, 1990) which were expanded during the 3rd century. It is likely the site was home to traders, artisans and farmers (Bonsall, et al., 2016). There is some debate over the Roman name for the settlement. There are two possibilities including *Causenna-* which was described by ancient writers as being on the main road leading from *Lindensium* to *Londinium* and *Sidnacester* (Gibson, et al., 1819).

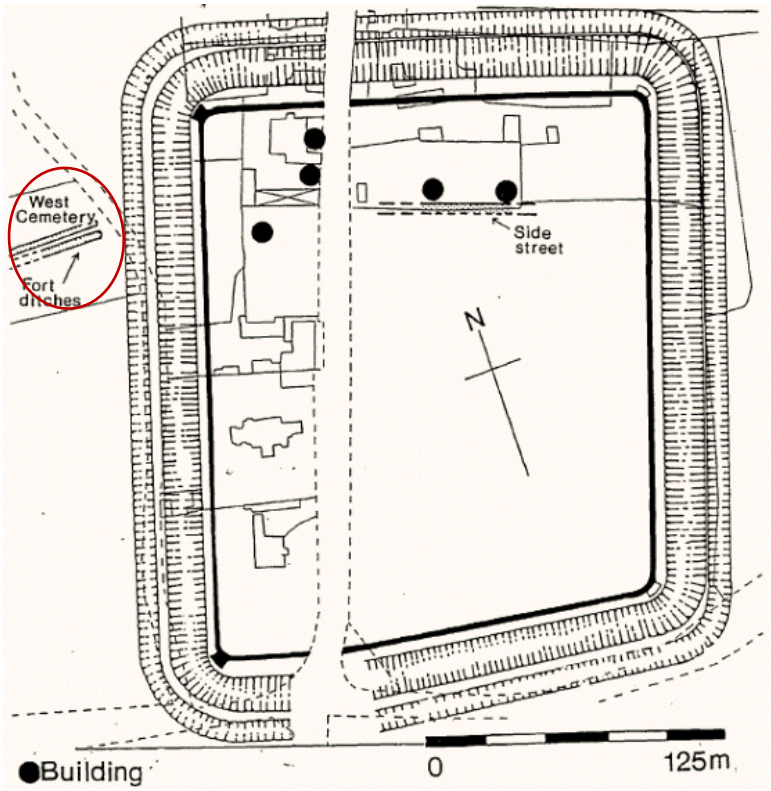



*Figure 23. Map of Roman Ancaster (from Todd 1975: 216).*

The inhumations date from the 3rd through to the 5th century and were located about 100 yards from the south wall leading west. A total of 327 skeletons were excavated including men, women and children. Among the remains, 53.1% (n= 129) were initially determined to be male while 34.1% (n= 83) were found to be female (Cox, 1989). Based on preservation and initial demographics 38 individuals were examined, of which 35 fell within the parameters set for the study.

### *5.2.2 Ashton, Northamptonshire*

Although the Roman name for modern Ashton remains unknown, it was a small market town or *vicus* located along a series of key trading routes along the River Nene and positioned between *Durobrivae* and Titchmarsh (Figure 24). It is one of the earliest Roman settlements dating to the 1st century CE and remained in use until the 5th century (Burnham & Wacher, 1990). As it was not walled, it is known as an 'undefended' Roman town. Similar to other small settlements in

the area, the main road contained structures along both sides with the majority of the settlement centred on a loop road located alongside the main thoroughfare (Deegan, 2008). A series of inhumations were excavated between 1983 and 1984 which included 297 individuals dating from the 4th century, of which 39 were examined within the parameters of this study (Dix, 1983).

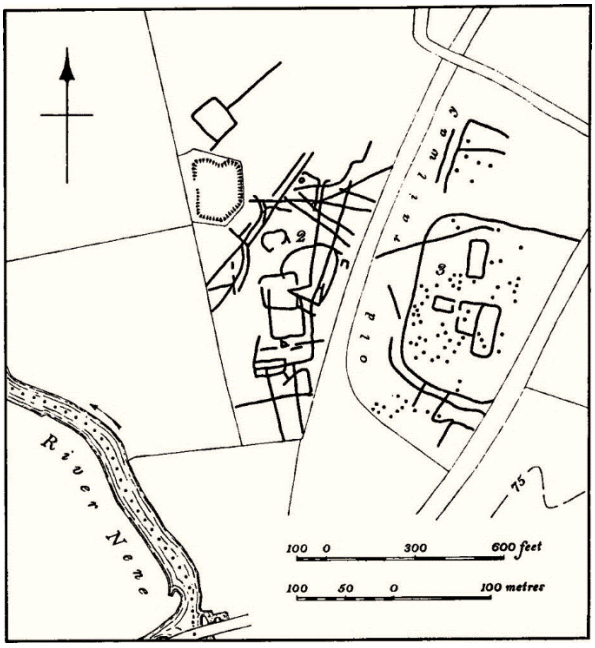



*Figure 24. Map of excavations from Roman Ashton (from British History 1975: 12).*

### *5.2.3 Baldock, Hertfordshire*

Baldock, located near the River Ivel, functioned as a *vicus* between the 1st and 5th century CE. It is located near a road junction dating from pre-Roman times with roads to Verulamium, Colchester and other towns. During the Roman period it was a local market town and cult centre, with small-scale craft production, which drew in people from the surrounding countryside (Fitzpatrick-Matthews, 2016). Although located in a strategic location, there is no evidence for a large military presence; however, the main roads show evidence of intensive occupation including an extensive road and enclosure system developed from the earlier Iron Age site (Burnham & Wacher, 1990).


*Figure 25. Major cemeteries in use after 200 CE: 1 Icknield Way East, 2 Clothall End, 3 Icknield Way Roadside, 4 Royston Road, 5 Sale Drive East, 6 Sale Drive West, 7 Yeomanry Drive South, 8 California, 9 Wallington Road, 10 The Tene, 11 Walls Field, 12 Clothall Road, 13 South Road. Shaded area represents the extent of Later Roman Baldock. Stane Street was not in use after the 2nd century CE, (from Fitzpatrick-Matthews 2016: 35).*

The area surrounding Roman Baldock was extensively excavated with 22 separate excavation sites, primarily located north and east of the settlement. Although 13 major excavations have produced over 1,659 individuals (Figure 25), the cemeteries associated with Baldock are primarily cremations and mixed-rite sites with few inhumations limited to California, Royston Road and Stane Street. Within the inhumations associated with Baldock there were very few grave goods and the use of coffins was rare. In later Roman cemeteries such as California, the rate of secondary and tertiary burials disturbed many of the original burials resulting in a lower level of preservation or completeness among 1st and 2nd century burials (Fitzpatrick-Matthews, 2016). Preservation and organization of the storage areas resulted in a low number of individuals within the study sample: California (n= 16), Royston Road (n=4), Sale Drive West (n=5) and Stane Street (n=7) for a total of 32 individuals dating from the 2nd to 4th centuries AD.

### *5.2.4 Alchester, Oxfordshire*

The Latin name of a larger settlement located a day's journey northwards from Dorchester-on-Thames at modern Bicester is also unknown. Alchester was the larger of the two towns and was occupied from the 1st to 4th century (Salzman, 1939; Burnham & Wacher, 1990). The town itself

was designed to follow a grid pattern within the defensive walls. As with other similar sized settlements it included a bathhouse as evidenced by a hypocaust and a temple. As a minor walled town, classified as a *vicus*, Alchester was built along the junction of five Roman roads connecting the town to Silchester, Verulamium, Cirencester and Bath. As the town was located along overland trade routes it allowed for the area to develop into a major trading centre. Important trade routes might explain the extensive additions to the fortifications during the 3rd century and the towns decline in the 4th century (Burnham & Wacher, 1990). The main cemetery associated with Alchester is 50 metres east of the south-eastern corner of the settlement and contained 28 inhumation remains. However, smaller areas have produced inhumations including 15 inhumations with an east-west layout in Folly Field discovered in 1925 (Alabaster, et al., 1994).

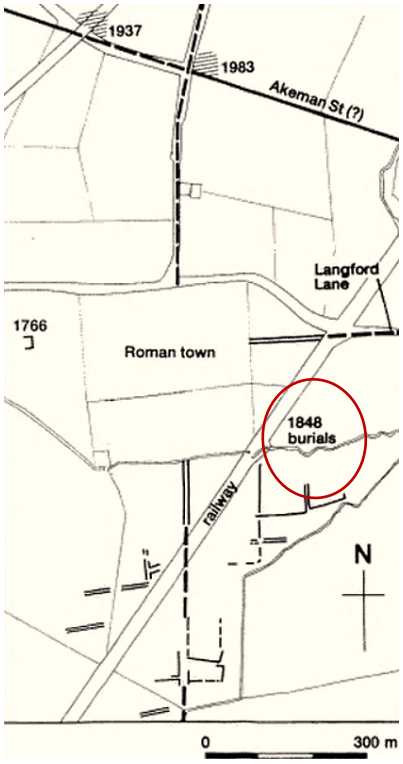



*Figure 26. Map of Roman Alchester showing location of burial sites in red (from Burnham & Wacher 1990: 335)*

The excavations at Alchester from 1991 focused on the main cemetery site associated with the walled town and nearby military fort which housed legionaries and cavalry. However, recent excavations undertaken along Wendlebury Road, Bicester, focused on burials from the south of the settlement (n=45). The burials had limited grave goods, primarily pottery sherds, including Samian ware (Cotswold Archaeology, 2016). To-date there has been no published osteological report for Wendlebury Lane and from the 14 individuals examined, six were included within the study; however, they have not been dated to a specific period of Roman occupation.

### *5.2.5 Corinium Dobunnorum, Cirencester, Gloucestershire*

Located on the western bank of the River Churn, Roman *Corinium* was founded in the 1st century and occupied throughout the Roman period (Figure 27). Initially established as a military encampment in the mid-1st century, the *civitas* for the *Dobunni* tribe quickly grew to become the second largest town in Roman Britain (McWhirr, et al., 1982). As with other *civitatas capital*, *Corinium* served as a model Roman city in Britain and included temples, a very large forum and basilica, temples, baths and amphitheater, all surrounded by fortifications (Hurst, 2005). The city's ideal location along the river and Fosse Way, with its connections to Verulamium and Leicester, allowed the town to quickly grow into a prosperous trading and hub and seat of government bureaucracy. During the 2nd and 3rd centuries the town was enhanced further including rebuilding the basilica, followed by an expansion of the forum and amphitheater. The continuous building in *Corinium* provides evidence of the city's importance and sustained growth. Additionally, the prosperous residents commissioned large mosaics, sculptures and wall paintings to express their wealth and connection to Rome. Unlike other cities in Britain during the 4th century, *Corinium* continued to expand with new houses incorporating heated rooms and bath suites. However, during the 5th century the city began to lose its importance and, after severe epidemics and political instability in the 5th and 6th centuries, the city was slowly abandoned (Wacher, 1975). The cemeteries associated with *Corinium* were located to the south outside the city walls, on either side of Fosse Way, near the Amphitheatre and quarry (McWhirr, et al., 1982) (Figure 27).

Excavated from 1969-1976, the main cemetery associated with *Corinium*, Bath Gate, contained 362 Romano-British burials with additional burials found in other areas of the town itself. The area of the cemetery was initially a quarry site during the 2nd century, after which it transitioned into a burial site. Possibly linked to the city's military history, the 60% of burials were males (n=241) compared with 24% (n=96) females and 15% (n=63) children or infants found at the site. A total of 39 individuals from three sites were including: Bath Gate (n=17), Gambier Parry Lodge (n=7) and Kingsholm Drive (n=15) which primarily date from the 4th century AD.

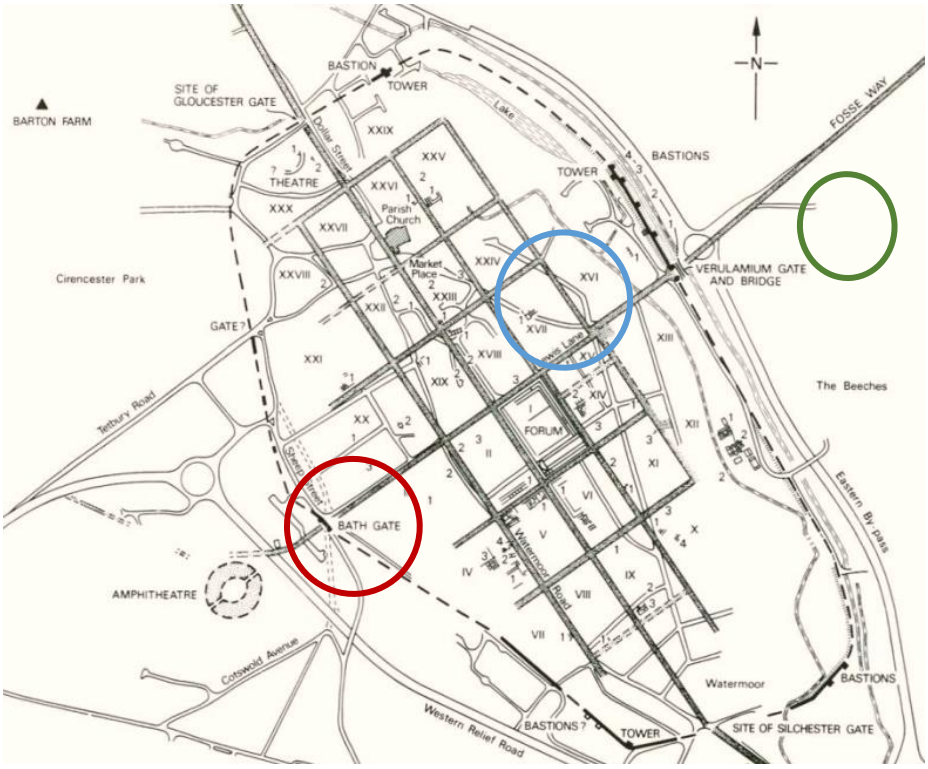



*Figure 27. Plan of Corinium Dobunnorum with Bath Gate in red, Kingsholm Drive in blue and Gambier Parry Lodge in green (from McWhirr et al. 1982: 20)*

### *5.2.6 Camulodunum, Colchester, Essex*

Colchester is located near the tidal zone of the Colne estuary, alongside the River Colne. Camulodunum was the capital of the Trinovantes and then the Cattuevellauni tribes. In 49 CE, a Colonia was founded on the spot for veteran soldiers who were given land at retirement. The settlement included a temple dedicated to Claudius, although this was destroyed during Boudicca's revolt in AD 60/1 (Crummy, 1997). The city contained two theatres, a circus and a formidable city wall. The wealth of the city is evident by numerous mosaics, particularly from the 2nd century when large homes with hypocaust systems were built. Unlike many other Roman cities, Colchester fell into disuse and decline the late 4th century, and in the early 5th century there is evidence of violence and disruption to trading networks (Phillips, 2017).

Primarily excavated in the 1970s and 1980s (Figure 28), Butt Road is located near the south-west corner of the settlement, just outside the main gate as was customary for Roman cemeteries. Although it was in use for over three centuries, the majority of burials date from the 3rd and 4th centuries and follow a similar pattern to other potentially Christian burial sites, with few grave goods and evidence of coffins (Crummy, et al., 1993). Of the over 700 recorded burials very few are available for study; therefore, of the 108 of which were examined, 62 individuals dating from the 4th century AD were used within the study.

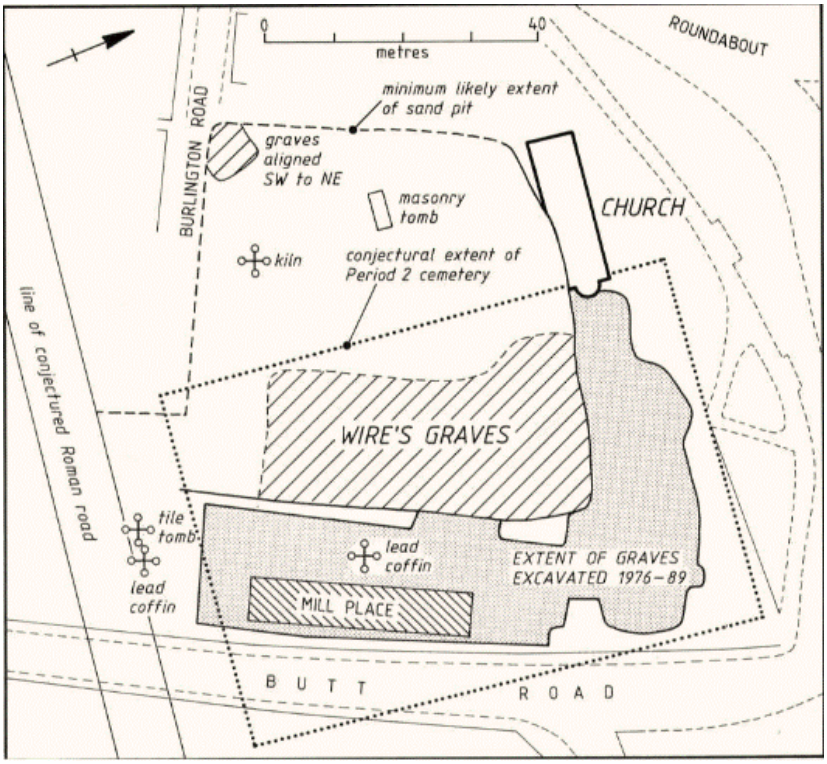



*Figure 28. Extent of 4th-century cemetery and excavations from the 1970s-1980s (from Crummy, et al. 1993: 6).*

### *5.2.7 Dorchester-on-Thames, Oxfordshire*

The name of the Roman settlement located near the modern town of Dorchester-on-Thames, suggested to possibly be *Dorcic*, has not survived (Salzman, 1939; Burnham & Wacher, 1990). The settlement at Dorchester-on-Thames is at an important junction for overland trade routes which allowed it to develop into a major pottery centre (Figure 29). Occupation of the surrounding area began during the Iron Age, as there is a suspected 1st century fort and evidence of urban occupation on the flood prone, low-lying area. Excavated Roman buildings date primarily to the mid-2nd century but pottery found on the site dates to the 1st century and kilns continued to be built during the 3rd century. By the 4th century roofs began to collapse, making it difficult to determine when exactly the town was first settled and why it quickly fell into disuse (Burnham & Wacher, 1990). Two separate cemetery sites are associated with the site including Queensford Farm and Queensford Mill, along with an additional location opposite the Thames River named Church Piece (Chambers, 1987). An additional site located on the south side of Dorchester-on Thames, 11 Wittenham Lane, was excavated in 2011 (Williams, 2013).

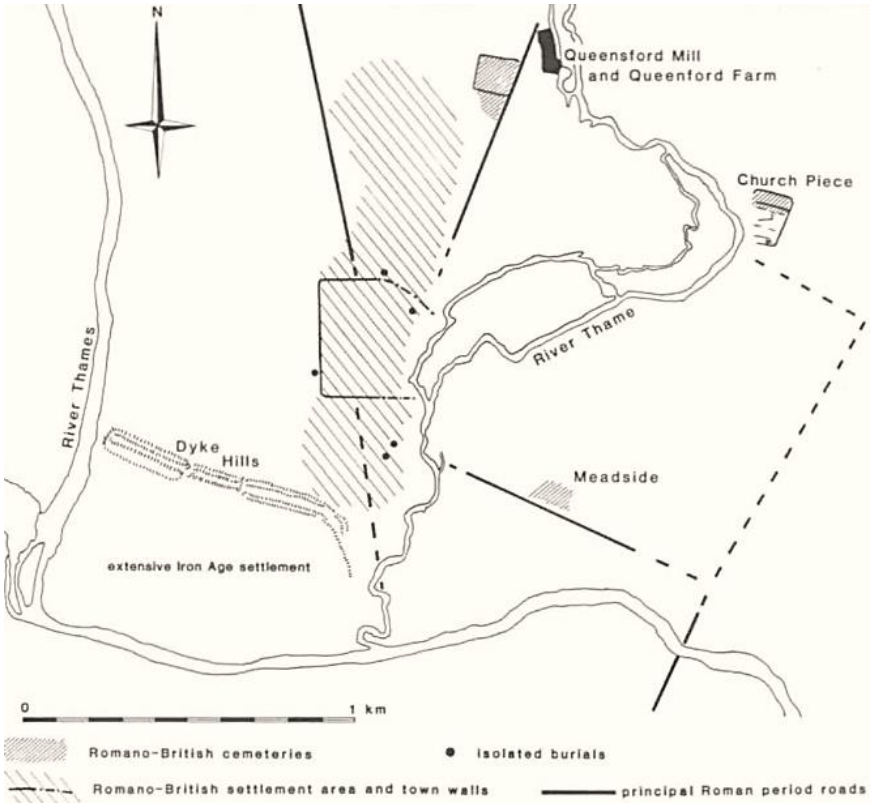



*Figure 29. Map of Roman Dorchester-on-Thames showing the location of Queensford Mill and Queensford Farm, along with the extent of Romano-British cemeteries (from Chambers 1987: 37)*

Excavated in 1972 and 1981, Queensford Farm was in use during the 4th century AD. As a rescue excavation between 78 and 82 graves were initially excavated although additional graves were noted (Durham & Rowley, 1972; Chambers, 1987). It was in 1981 that additional excavations at Queensford Mill were carried out in which an additional 82 graves were excavated (Figure 30). The graves were situated within a large enclosure 700 meters outside the town (Durham & Rowley, 1972). It is estimated to contain over 2,000 individuals dating from the 4th and 5th centuries, making it one of the largest Late-Roman cemeteries in Britain. However, only 164 graves have been excavated (Chambers, 1987). At Queensford Farm, 35% (n=27) graves included goods and there is evidence for the use of coffins. However, at in the Queensford Mill excavation of grave foods were rare. The ordered cemetery is mainly aligned west-east with only a few exceptions (Chambers, 1987). Dating was difficult and done based on pottery and carbon dating suggests the date would be early-4th to early-5th century, making it one of the latest cemeteries used in the study (Durham & Rowley, 1972). Overall the preservation of the individuals is poor due to extensive farming and disturbance during construction. However, as the site is gravel, deeper graves survived much better (Chambers, 1987). Of the 53 individuals examined, 24 were including with the study and date from the 3rd and 4th centuries AD.


*Figure 30. Map of Burials, Queensford Farm and Queensford Mill in detail (from Chambers 198: 38)*

Excavated in 2013, the area was primarily occupied from the 2nd to 5th century and Wittenham Lane is connected in the north to the Roman road leaving Dorchester-on-Thames toward Dyke Hills (Williams, 2013). The excavation yielded 24 burials with excellent preservation, although only 23 were fully exhumed, all of which were supine and organized west-east in rows (Figure 31). No grave goods were found to be associated with the remains. Out of the 6 individuals from the 2nd and early-3rd century AD which were examined, 5 had excellent preservation and fell into the parameters of the study.

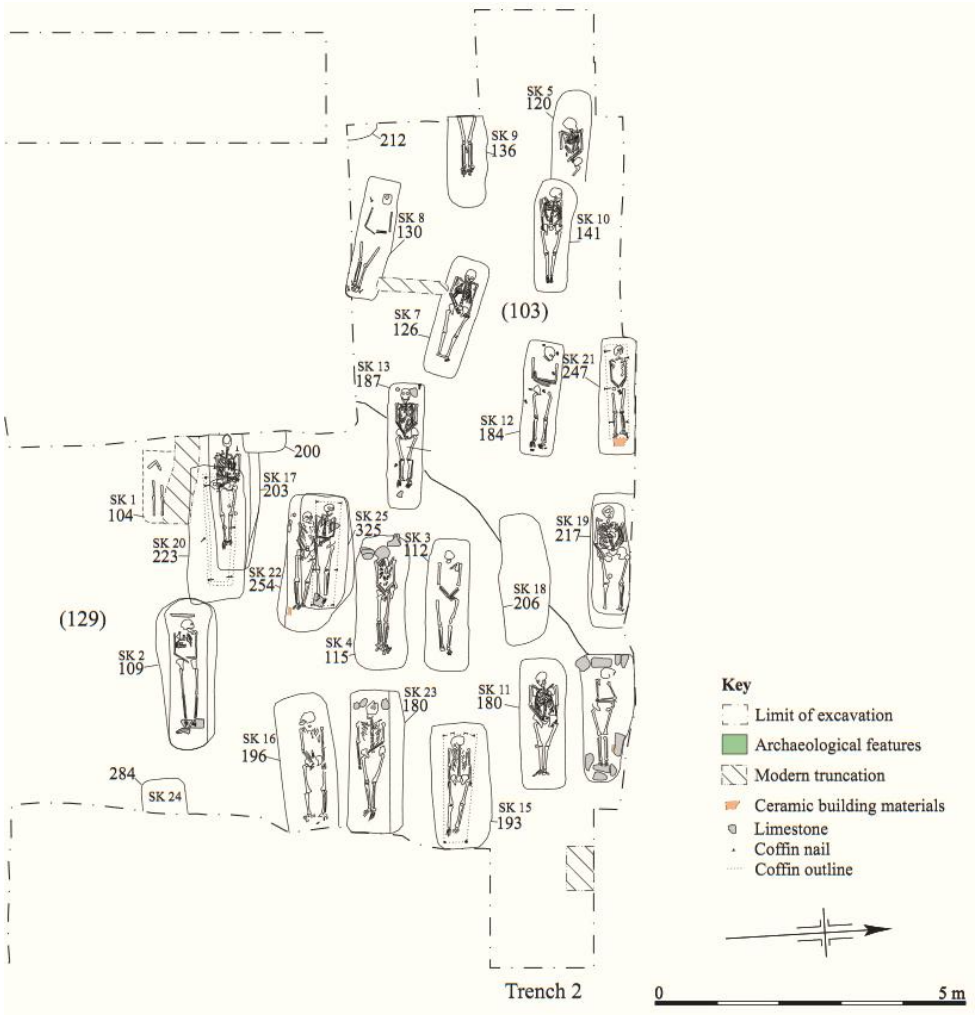



*Figure 31. Map of Burials, 11 Wittenham Lane in detail (from Williams 2013, 22).*

### *5.2.8 Durnovaria, Dorchester, Dorset*

Located in modern Dorset, *Durnovaria* was designated as the *civitas* capital for the *Durotriges* tribe. The town was founded by the Romans in mid-1st century, but the site held a variety of settlements and defences from the Iron and Bronze ages (Farwell & Molleson, 1993). While under the Romans the town served as both a regional administrative centre and as an important trading centre due to its proximity to the river Frome (Wacher, 1975). The town grew in importance during the 2nd century and as a *civitas capital* it offered those living in Britain a 'Roman' way of life by containing a bath house filled from an aqueduct, buildings covered in paintings and mosaics, and even an amphitheatre (English Heritage, 1970) located just under a kilometre outside the South Gate. The cemeteries associated with *Durnovaria* were Poundbury Camp and Fordington both located a few kilometres away from the town site; however, infant burials were also found within the city walls. Aside from the cemeteries, various industrial areas such as forges and quarries have also been excavated. Therefore, it is difficult to determine the

wealth and status of residence. Within the town, houses are a mix of poor and wealthy evidenced by the mosaics and high-quality furniture (Wacher, 1975).

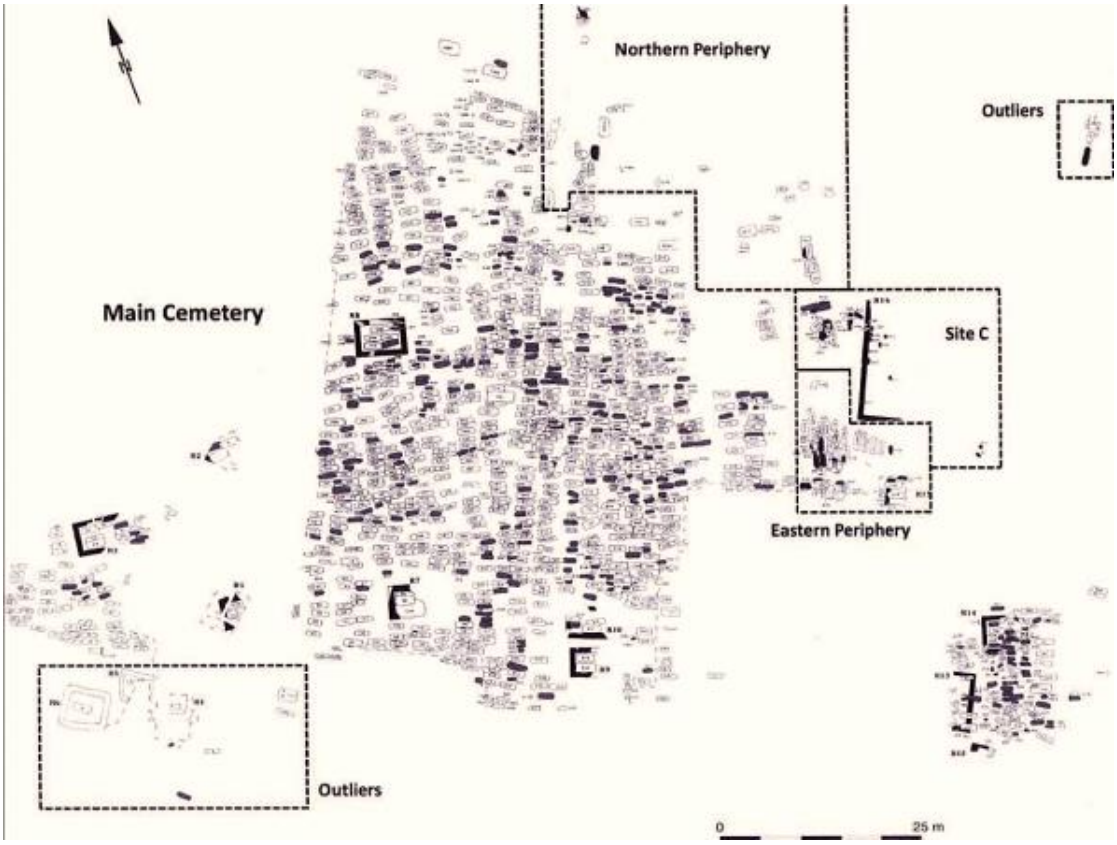



*Figure 32. Detailed map of burials associated with Poundbury Camp, Durnovaria (from Lewis, 2010: 407)*

Located in modern-day Dorchester and dating from the 1st-5th century AD, the cemetery at Poundbury Camp served the nearby *civitas* capital of *Durnovaria* (Molleson, 1989). Although only partially excavated, it is the largest Romano-British cemetery with over 1,400 burials unearthed during excavations between 1966 and 1982. The majority of these burials date from the 4th century. As the site was in use throughout the Roman period, changing burial practices influenced the layout, type of burial and grave goods. While the majority of the site is categorized as an ordered cemetery, defined by rows of individuals buried in coffins aligned north-south, the site also contains a section of east-west graves and 11 mausolea (Farwell & Molleson, 1993). It is currently the largest excavated Romano-British cemetery with 1160 individuals. However, as the surrounding area is chalk which can cause bones to become fragile and eroded the preservation of remains from the site varied greatly. This significantly reduced the sample size available and of the 384 individuals' pre-selected based on preservation, 131 from the 3rd to 5th century AD fell within the study parameters.

### *5.2.9 Colonia Nervia Glevensium, Gloucester, Gloucestershire*

The *Colonia Nervia Glevensium* was established near Kingsholm along the eastern bank of the River Severn. Initially the area served as a military site in the mid-1st century, first as a fort then a legionary fortress, with the *Colonia* founded in AD 97 (Wacher, 1975). Although the city contained a forum and the other expected buildings of a *colonia*, the town lacked an amphitheatre and did not follow a strict Roman town plan and the forum was situated in such a way that the main road cut through it ( Figure 33). Just outside the main walls, the city developed intensively urbanized areas to the north and north-east which were supported by a river crossing and river port (Hurst, 2005). Access to trade routes was important for the city and the city shows evidence of iron-working and pottery manufacturing. Houses and villas contained mosaics, sculptures and other displays of wealth; however, the quality is not as high or pieces as numerous as those found in wealthier *civitas capitals* such as *Durnovaria*. It is theorized that the town fell into disuse because of potential flooding or plague in the 5th century (Wacher, 1975). Although there is a late 2nd century mass burial site connected to *Glevensium* the individuals found in grave most likely died from an epidemic disease, possibly the Antonine Plague and not warfare (Chenery, et al., 2010; Simmonds, et al., 2008). Cemeteries associated with *Glevensium* were located along the southern and eastern gates, with additional burials located in the west near the River Severn, beyond the extramural settlement at Kingsholm and Wotton (Simmonds, et al., 2008).

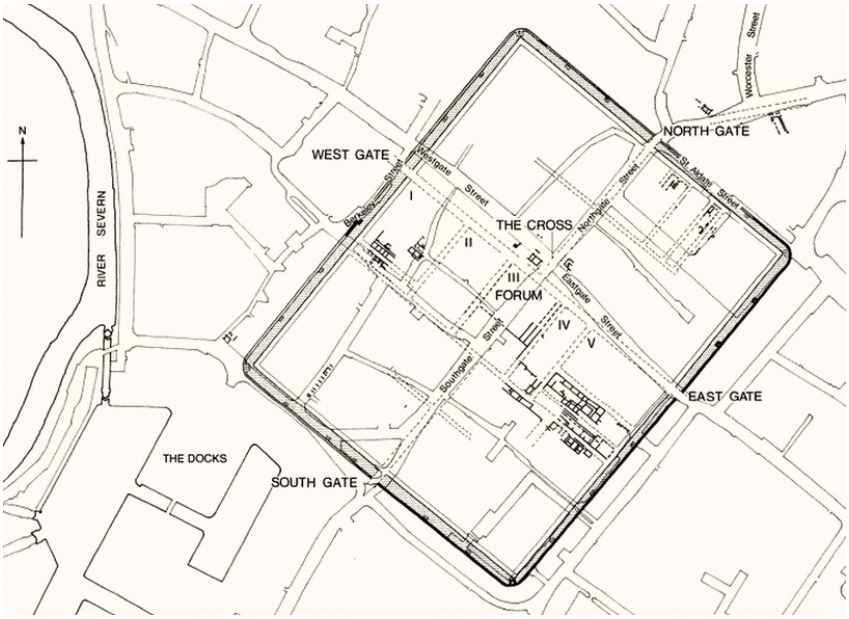



*Figure 33. Map of Roman Gloucester, mid-2nd century (from Watcher 1975: 153).*

Between 2004 and 2006, Oxford Archaeology excavated London Road, which is associated with Wotton burial grounds of *Glevensium*. The cemetery, which was in use from the 2nd to 4th

century (Figure 34), contained inhumation burials (n=64) along with a mass grave (MNI=91). However, no remains from the mass grave were examined as part of the study. The section of the inhumation cemetery excavated contained primarily adults with more males than females. Grave goods included coins, pottery and animal bones. Poor preservation limited the sample size and of the 12 female or non-adult skeletons selected for study only 6, dating from the 2nd-4th century AD had a high level of preservation allowing them to be included in the study.

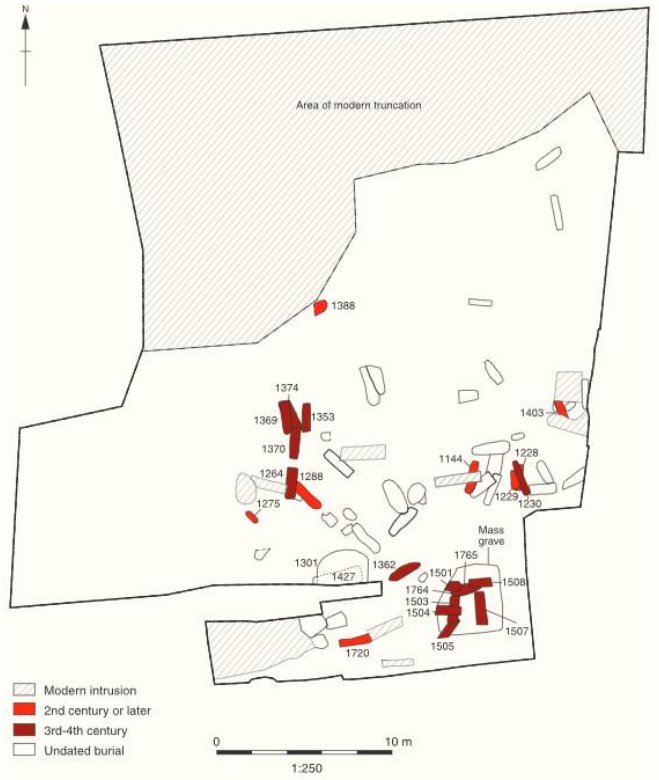



*Figure 34. Map of burials associated with the Later phase of Roman Gloucester (from Simmonds, et al. 2008: 14).*

### *5.2.10 Lindinis Durotrigum, Ilchester, Somerset*

Situated along the Fosse Way and River Yeo, *Lindinis Durotrigum*, began as a military encampment based around two forts in the mid-to-late 1st century. It was during this period when civilian housing sprawled outside the military fortifications as the settlement became a *vicis*. When the military abandoned the site, civilians continued to expand the settlement by rebuilding along the Fosse Way and other trade routes to Exeter and Dorchester (Burnham & Wacher, 1990) As the town expanded during the 2nd and 3rd century the buildings tended to rely on a natural rise in gravel above the floodplain since there is evidence for flooding in the town; however, the affected area was quickly rebuilt with new buildings on top of the old rubble (Burnham & Wacher, 1990; Gerrard, 2013). This building practice allowed for urbanization but also encouraged suburban sprawl along the main roads surrounding the town. The new

developments included status symbols of wealth such as mosaics, but the town lacked other common displays such as an abundance of sculpture. It was at this point in the town's development that it became a second *Civitas capital* for the *Durotriges*. It was far more influential than other towns similar in size and this allowed it to survive through the 5th and into the 6th century (Wacher, 1975; Burnham & Wacher, 1990). The inhumation cemeteries associated with *Lindinis Durotrigum* are located to the north of the river and also to the south along Fosse Way (Figure 35). Although the majority of burials, an estimated 1500, are in the northern cemetery site only the southern sites of Little Spittle and Townsend Close have been excavated. Little Spittle was excavated in the 1970s and is the smaller of the two southern cemeteries associated with *Lindinis Durotrigum.* It is located along the western side of Fosse Way, in an area of higher ground and outside the town walls. Initially the area was designated as an extramural settlement site; however, in the 4th century as the town grew it developed into a cemetery site. Of the 14 individuals examined, 8 which dated from the 4th century AD were used in the study.

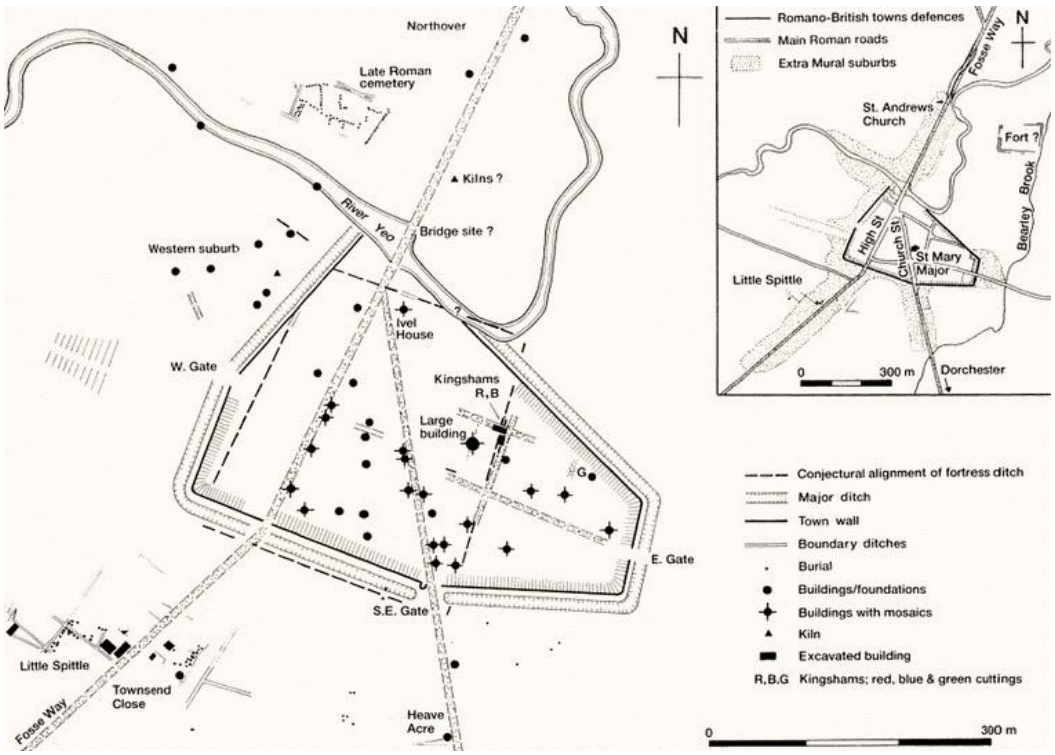



*Figure 35. Map of Lindinis Durotrigum and surrounding suburbs (from Burnham & Wacher 1990: 63).*

### *5.2.11 Venta Belgarum, Winchester, Hampshire*

Located along a vital trade route which connected Cirencester, Silchester and other cites, the road networks including bridges over previous marshland allowed *Venta Belgarum* to prosper throughout the 1st through 4th centuries. The Iron Age defences of hill forts in the area most

likely fell into disrepair prior to the arrival of Roman troops in the 1st century CE (Wacher, 1975). Building projects, mosaics and large hypocaust systems constructed during the 2nd century illustrate the town's wealth. However, the once prosperous city filled with merchants and soldiers began to decline shortly after 350 CE (Salway, 1993).

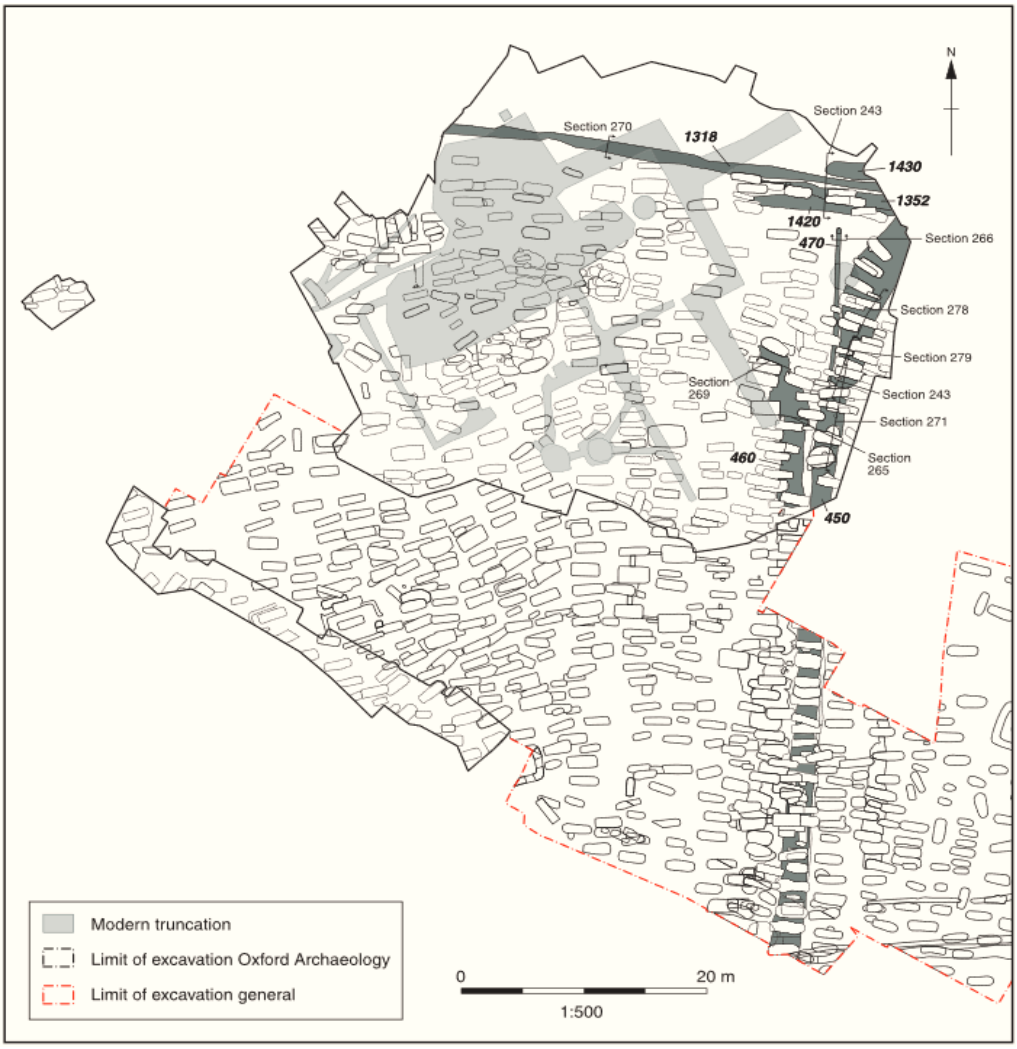



*Figure 36. Extent of Roman burials at Lankhills, Winchester (from Booth et al. 2010: 18)*

The largest excavated cemetery associated with the *civitas capital*, Lankhills, was excavated in the 1960s and 1970s (Clark, et al., 1979), followed by a second period of excavations between 2000 and 2005 by Oxford Archaeology (Booth, et al., 2010). During this period 451 graves from the 4th and very early 5th century were excavated during the first series and another 332 from the OA excavation. The cemetery is situated just outside the northern wall and is a mixed ritual site with both cremations from the earlier period and inhumations dating from the main period of use (Figure 36). Recently conducted isotope analyses suggests that Lankhills had a migrant population from throughout the Empire (Evans, et al., 2012); however, many of these were determined to be male or wealthier females who members of the elite, while others were

determined to be migrants based on grave goods which did not align with the isotopic evidence (Eckardt, et al., 2014). A total of 78 individuals from four sites, Andover Road (n=4), Lankhills (n=52), St Martins Close (n=4) and Victoria Road (n=18) all dating from the 4th and early 5th century AD were included within the study.

## 5.3 METHODS

Methods selected for the study reflect long established adult ageing and sexing methods, along with more recently published material on pubertal timing based on skeletal markers. It is paramount to use accurate age and sex assessments to determine the relationship between physical and social development throughout the life course. While human remains provide the physical age in relation to chronological years, it is the social age which provides the context within the life course. Therefore, both sexing and ageing categories incorporated specific biological features depending on physical development and emphasize the gendered female social development.

### *5.3.1 Sex Estimation*

As the aim of the study is to understand the female life course, only Females (F) or Possible Females (F?) were used in the analysis. Non-adults, those under the age of 20.0 were determined based on skeletal development and dental ageing. Sexing of non-adult remains is problematic as the secondary sexual characteristics established during or after puberty are absent (Schutkowski, 1987). While sex estimation of young children remains challenging, the continued refinement of methods has demonstrated greater sexual dimorphism from an early age with accuracy rates often influenced by the age of the child at death (Mays, 2000). This is particularly true after 10 years of age when early signs of puberty begin to trigger skeletal changes (Lewis, 2007; Rogers, 2009; Shapland & Lewis, 2013). Other options for sexing non-adults include biomolecular methods or sex based morphological differences in dentition (Rösing, et al., 2007; Daskalaki, et al., 2011). Macroscopic methods developed for the mandible, humerus and ilium were used in this study, focusing on features that provided at least 70% accuracy which is the threshold for modern forensic methods. Some features, such as the anterior dental arcade and gonial eversion of the mandibular ramus, display high accuracy rates for males. These features were used to eliminate potential males from the study.

#### *5.3.1.1 Sex Assessment: Non-adults*

The non-adult sexing methods used stem from three publications which sought to examine in detail the ability to accurate sex non-adults at various stages of development. Rogers (2009), conducted a follow-up study based on previously published methods which successfully used the distal humerus to sex non-adults (Rogers, 1999). The most recent study included European remains (n=42) of adolescence between the ages of 11 and 20 years at death from Spitalfields

(n=5 females and n=2 males) and Lisbon (n= 17 females, n=18 males). Sutter (2003) tested eight previously proposed non-metric traits of the ilia and mandible for use in sexing non-adults which are based on previously published methods (Schutkowski, 1987) on a group of Chilean mummies (n=85) between newborn and 15 years of age. The aim of the study was to determine which methods met the criteria of 70% accuracy for forensic cases. Each trait was independently examined and received a scored between 1 and 5, with 1 or 2 representing a male and 4 or 5 female. Therefore, every element produced its own accuracy rating and as a result, only four methods achieved the necessary accuracy, the arch criteria (82.3%), angle of sciatic notch (80.7%), depth of the sciatic notch (79.0%) and mandibular arcade shape (77.6%) (Sutter, 2003; Schutkowski, 1987).

Rogers (1999), conducted two studies both of which achieved higher than the necessary 70% accuracy using the distal humerus to sex non-adults. His studies relied on using four aspects of the distal humerus which revolved around morphological changes in the carrying angle of females in comparison to males. Research shows that women have a greater lateral angulation of the radius and ulna relative to the main axis of the humerus (Grabiner, 1989). This results in and a high frequency of septal aperture or supratrochlear septum in females. When all the methods are combined, the results are 92% accuracy (Rogers, 1999) for adults and 81% accuracy (Rogers, 2009) for non-adults. When broken into age categories, accuracy greatly improved with age due to ossification. No detailed breakdown of the results based on age is provided. Additionally, Rogers omitted accuracy rates for individual aspects of the distal humerus. As a result, an additional larger (n=351) study using only adults was conducted (Falys, et al., 2005). Unfortunately, no age ranges were provided for the adult individuals and the resulting adult study determined that a combination of all four traits provided an accuracy rate of 79.1%. However, as the distal humerus begins to ossify throughout adolescence the accuracy of individual aspects should not be influenced by age once fusion occurs. This method has been used in other studies focusing on physical development during the adolescent period (Shapland & Lewis, 2013). Rogers' method (Rogers, 1999; 2009) requires placing the anterior surface of the humerus, preferably left, on a flat surface so the researcher is able to look directly down on the posterior surface. The results of the individual traits are scored 1-3 with a score of 1 for female and 3 for male. When an inconsistency occurs the olecranon fossa was used as the deciding factor as recommended. No modifications to the method were needed when examining the Romano-British population.

In females the trochlear construction and shape is more developed (Figure 37) thus resulting in a markedly more constricted shape, with a bow-tie appearance, whereas in males this space is underdeveloped resulting in much slighter or flat space (Rogers, 2009). The accuracy rate for

trochlear constriction among adult women is 88.0%, while trochlear symmetry is 79.0% (Falys, et al., 2005). This method is only usable once the humeral trochlea had fused during adolescence. Independent scores were assigned to the shape and to the symmetry.

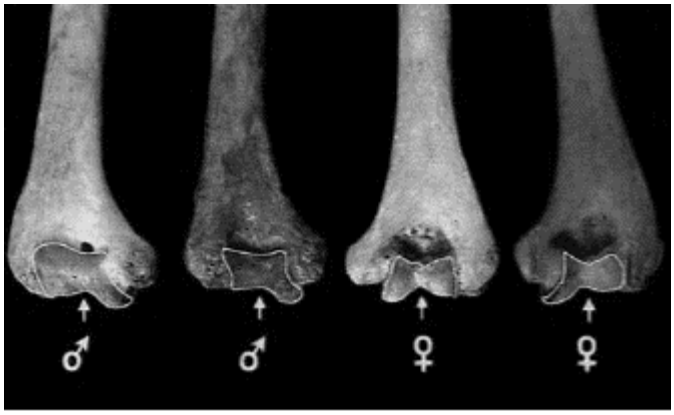



*Figure 37. Non-Adult sexing of the distal humerus, trochlear symmetry and shape (from Rogers, 2009: 58-59).*

The olecranon fossa depth and shape in females is influenced by the carrying angle as a result of a wider pelvis to aid in childbirth (Figure 38). Females develop a deep oval shape to accommodate a carrying angle of 20-25 °, while males have a smaller triangular shaped olecranon due to their smaller carrying angle of 10-15° (Rogers, 2009). The accuracy rate for the olecranon fossa shape is 76.6% in adult women (Falys, et al., 2005). A singular score was noted reflecting the depth and shape of the olecranon fossa. As this method does not require ossification to occur it can be used in younger individuals.


*Figure 38. Non-Adult sexing of the distal humerus, olecranon fossa depth and shape (from Rogers, 2009: 58-59).*

The angulation of the medial epicondyle is raised in females, while it is flat in males (Figure 39). The accuracy rate of the angle of medical epicondyle is 77.8% for adult women (Falys, et

al., 2005). This method is also dependent upon fusion similar to the trochlea. This method does not require full ossification of the medial epicondyle. A single score was noted based on the angle projecting away from the flat surface.

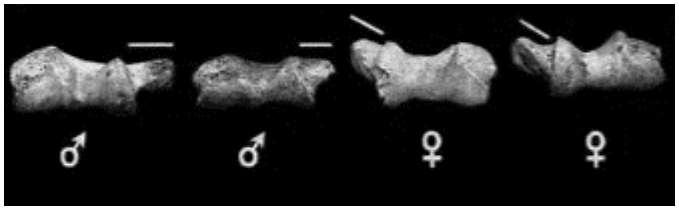



*Figure 39. Non-Adult sexing of the distal humerus, angulation of medial epicondyle (from Rogers, 2009: 58-59).*

As a result of chemical changes which occur in-utero sexual dimorphism of the ilium is commonly used to sex populations of all ages. Additionally, the sex results of the pelvis take precedence over other morphological changes, such as those found in the skull (Brothwell, 1981; Buikstra & Ubelaker, 1994). This is similar when sexing non-adults and priority was given to the pelvis when results disagreed with those from the skull. Among the Romano-British population examined, the scoring system was slightly modified from Sutter (2003) to mimic that used in other methods with a 1 or 2 representing a female and a 4 or 5 representing a male. The left ilium was used unless external causes such as poor preservation or pathology that affected the morphology made it necessary to use the right ilium.

As with adults, the greater sciatic notch provides evidence of sex with a high degree of accuracy with 100% of females (n=6) between the ages of 6 and 15 being sexed correctly (Sutter, 2003). Additionally, studies arrived at an accuracy rate of 84.9% among 0 to 17-year olds (Wilson, et al., 2015). This method does not depend on any ossification points and therefore is usable across numerous age groups. When using the greater sciatic notch females will have an angle greater than 90° and have a shallow depth. As with adults, the males will have a deeper depth and narrower angle (Figure 40). Two independent scores were assigned, one based on the angle and a second based on the depth.

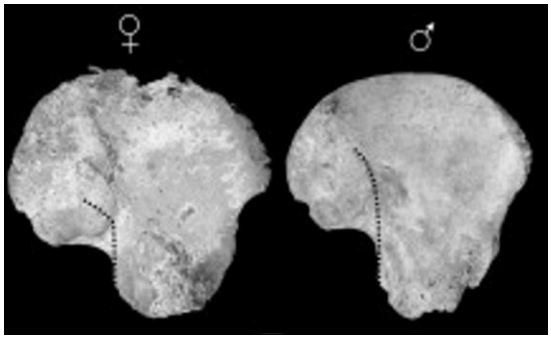



*Figure 40. Non-adult sexing of the ilium (from Cardoso & Saunders, 2008: 26).*

The arch criteria refers to the auricular surface of the ilium (Sutter, 2003; Schutkowski, 1987). In females, there is a posterior projection of the arcuate line through the auricular surface (Figure 40). In males, the projection boarders the superior portion of the auricular surface. Although tested on a small sample size, it achieved an accuracy score of 100% (Sutter, 2003).

##### 5.3.1.1.1 Male orientated morphological changes of the mandible

While the aims of the study are to examine the Romano-British female life course, it is possible to eliminate males from the available remains based on morphological changes that occur only in males. Three such methods were used, the mandibular arcade shape (Loth, 2001; Sutter, 2003) and gonial eversion (Sutter, 2003). The anterior dental arcade of females is rounded symphyseal base forming a 'U' shape, in males this presents as a rectangular shape which extends sharply downward. In a study of 62 individual's ages 0-19 years of age, the anterior dental arcade accurately predicted sex between 89.45% and 74% due to differences in observers (Loth, 2001). Among males (n=5) between 6-10 years of age Rogers achieved an accuracy rate of 83% and 92% among 11 to 15-year olds (n=12). In females the accuracy rate was slightly lower, 80% among 6 to 10-year olds (n=4) and 67% among 11-15 year olds (n=9). However, both studies incorrectly sexed females. Two females in Loth (2001) and single female in Sutter (2003) presented with male attributes leading an incorrect sexing result. This demonstrates the methods success at eliminating males from the study, even though it is possible for a female to be incorrectly sexed as male. Gonial eversion at the base of the mandibular ramus is pronounced in males as the result of larger muscle attachments, leading to the gonion flaring outward in males while remaining undeveloped in females. As a result of the interconnectedness of the muscle size and skeletal changes this method has a higher success rate among older males aged 11-15 (91%, n=10), when compared to younger males aged 6-10 years (60%, n=3). The success rate among females is far below the accuracy threshold for use in forensics with 6 to 10-year olds successfully sexed at 50% (n=3) and 11-15 year olds at 55% (n=6). In archaeological populations females can present with large muscle attachments reducing accuracy; therefore, this method can only be used to eliminate males from the study but not confirm an individual as female. An additional measurement, the gonial angle was noted in an attempt to align the stage in development or chronological age at which it produces results in line with proven sexing methods (Ascádi & Nemeskéri, 1970).

### *5.3.2 Sex Assessment: Adults*

A very androcentric approach is used when assigning a sex to adult remains, with some scholars even referring to females as 'infantile' in appearance (Saukko & Knight, 2016). As a result, common methods rely on the lack of development of a specific skeletal element which can be influenced by muscle attachments or childbirth, to determine the sex of remains. For this study,

sex was estimated in individuals over the age of 18.0, through the visual examination of sexual traits of the skull (Walker, 1994; White & Folkens, 2000) including the nuchal crest, mastoid process, supra-orbital margin, supra-orbital ridge/glabella, gonial angle and mental eminence. Within the pelvis the greater sciatic notch, sacral alae curvature (Walker, 1994; White & Folkens, 2000) along with the ventral arch, subpubic concavity and medial aspect (Phenice, 1969) were used. While all individuals were assigned to one of five categories, Female (1, F), Possible Female (2, F?), Undetermined (3, ?), Possible Male (4, M?) and Male (5, M), only those individuals sexed as Female or Possible Female were included in the analysis. However, as the aim was to prioritize females and it is possible for males to exhibit female cranial characteristics, the pelvis was used when cranial and pelvic methods contradicted.

##### 5.3.2.1.1 Cranial Assessment

Methods provided in Buikstra & Ubelaker (1994) were used to determine the sex based on secondary sexual characteristics of the cranium including the nuchal crest, mastoid process, slope of frontal bone, supraorbital ridges and mental eminence (Ferembach, et al., 1980). The visual method relied on Walker (1994), reproduced in White (2000: pp 364) in order to improve interobserver discordance, as research has shown that clear definitions improve accuracy ratings (Walrath, et al., 2004). Each element was scored individually from Female (1) to Male (5), no preference was given to one aspect over another. The nuchal crest is located on the occipital bone and is influenced by the muscle attachments; therefore, a lack of development results in a score of 1. The mastoid process is located near the external auditory meatus, again in females this is less developed. Located in the orbit, the supra-orbital margin is sharp and less rounded than in males. Females also have a less defined, nearly flat, supra-orbital ridge or glabella. Lastly, the mental eminence, located on the mandible between the mental foramen, is also less developed in women. Additionally, the gonial or mandibular angle was measured using the angle between the ramus and the corpus of the mandible at the gonion. Females have an obtuse angle between 120° and 130° (Ascádi & Nemeskéri, 1970). However, the gonial angle can be influenced by ramus remodelling associated with age.

##### 5.3.2.1.2 Pelvic Assessment

The sexual dimorphism found in the pelvis stems from what is often referred to as the evolutionary conundrum of bipedalism and childbirth (Weaver & Hublin, 2009). In females, the pelvis has adapted to the demands of childbirth by displaying morphological characteristics that are absent or less developed in males, such as the curvature of the sacrum or shape of the sacral alae (Flander, 1978). The Phenice method (Phenice, 1969) incorporates the ventral arc, subpubic concavity and medial aspect of the ischiopubic ramus in order to determine the sex of an individual (Buikstra & Ubelaker, 1994). In females, the ventral arch forms a deep “ridge”

while the ischiopubic ramus contains a concavity and thin ridge. Incorporating both the shape and depth, the greater sciatic notch is scored from Female (1) to Male (5). Although when all pelvic methods are used together an accuracy rate of between 80% and 89% can be achieved, young males may display feminine characteristics due to environmental influences or simply differences in populations (Walker, 2005). This can be overcome by comparing both the Phenice method alongside the greater sciatic notch to determine females.

### *5.3.3 Age Estimation*

Individuals were divided into nine age categories developed for the study represent a blending of social development, life course events and transitions, along with the limits of accepted osteological ageing methods: 10.0-12.9, 13.0-15.9, 16.0-17.9, 18.0-19.9, 20.0-24.9, 25.0-29.9, 30.0-34.9, 35.0-39.9, 40.0-44.9. This allowed for two age cohorts to be used. Individuals aged 10.0-24.9 were used to understand pubertal timing and adolescent development and a second sample group aged 13.0-44.9 was used to understand pelvic development and potential obstetric complications during pregnancy and childbirth. Individuals above 45 years of age at death were excluded from the study due to the high likelihood that many would be undergoing menopause; and therefore, less likely to be experiencing pregnancy and childbirth hazards. Through using narrow age ranges, the stages of puberty and reproductive periods will emerge to provide evidence for discussing the chronological ages at which Romano-British females moved through the life course. Additionally, for those under the age of 20.0 single ages based on dental development were used to narrow down individuals into 1-year age groups. However, this resulted in small age groups and, therefore, for the larger study examining pelvic development, these were grouped into the above age categories. Additionally, the use of narrow age ranges also allows results to be compared with research based on standardized biological age categories (Falys & Lewis, 2011) among adult individuals above 20.0 years of age (see Appendix ii).

#### *5.3.3.1 Age Assessment: Non-adults*

Ageing non-adult individuals emphasises the level of development, such as fusion or growth, displayed on the skeleton. The primary form of ageing non-adults, dental ageing, is a multi-step process. It is first necessary to determine the stage of mineralization in the development of the crown, root and apex of permanent teeth. The developmental stage can then be assigned a mean chronological age. The individual's age is calculated by determining the mean age based on all available mandibular teeth (Demirjian, et al., 1973; Moorrees, et al., 1963; Smith, 1991). This may result in a two-year age range, however, using mandibular ageing from multiple teeth results in a mean age which can be used for determining 1-year age categories.

#### *5.3.3.2 Age Assessment: Non-adult and Adult transition*

In adult populations, the emphasise shifts from development to morphological changes associated with decline. Owing to the need for clarity of an individual's age as they transitioned from adolescence into adulthood a range of methods were used to age adult remains. Two methods are useful for addressing this period of development and growth, vertebral ring fusion and fusion of the first sacral vertebrae (S1) (Cardoso & Rios, 2011). Both methods received scores ranging from no attachment or fusion (0) to complete ossification (3) with no visible line of fusion. Vertebral ring ossification of the thoracic and lumbar vertebra were used to determine non-adult and adult ages in individuals between 14 and 25 years of age with an accuracy rate of 99.9% +/- 2.57 years (Albert & Maples, 1995). The mean age at transition between stages of sacral fusion of the S1 were also used to determine the age of an individual transitioning from adolescence to adulthood.

#### *5.3.3.3 Age Assessment: Adult*

Additional standard methods including the pubic symphysis (Brooks & Suchey, 1990) and auricular surface (White & Folkens, 2005) were used to age adults. The pubic symphysis is divided into 6 phases ranging from a mean age of 19.4 to 60.0 years of age. In younger remains there are ridges and furrows that wear down over time while in older remains the pubic symphysis is smooth eventually becoming depressed with a rimmed outer edge, which also eventually erodes (Brooks & Suchey, 1990). Similar morphological changes take place on the auricular surface. Young individuals are determined to have transverse billowing and fine granularity while over time there is a reduction in billowing which is replaced by striae. This change is also connected with a distinct coarsening and microporosity which continues until the surface is dense with no billowing and vague striae (Lovejoy, et al., 1985).

### *5.3.4 Stature and Body Mass*

Stature is a reflection of diet and overall health in past populations (Gowland & Walther, 2018); however, the relationship between childhood stress and height can make adult height difficult to determine (Byers, 1994) due to the varying lengths of long bones within a specific population (Killgrove, 2018). For individuals with fused proximal and distal femoral epiphysis, stature was determined by taking the maximum femoral length in cm, with a preference for the left femur whenever possible. As the sample was composed of females and possible females from a European population, the formula of [2.47 fem + 54.10] ± 3.72 was used (Trotter & Gleser, 1952). Previous Roman studies suggest that using the Trotter and Gleser (1952) formula for individuals of black decent; however, these studies take place in the city of Rome which would have had a different population structure compared to other parts of the Empire (Killgrove, 2018). As Roman Britain was a multicultural society, it is understood that number of

individuals from the sample may be from a different ancestry and require a different formula for higher rates of accuracy, however, it was not possible to determine the ancestry of each individual set of remains. Therefore, the white European formula was used to determine stature. This method was also chosen for consistency as the femur is robust and likely to be intact allowing for a larger sample size despite issues with body proportion (Gowland & Walther, 2018) as this is less of an issue when examining stature from an obstetric hazard viewpoint.

Body mass was determined using biomechanical methods which are based upon effects of load bearing as opposed to morphometric methods which require known body breadth, something difficult to assess in skeletal remains. As the lower limbs are more affected by load bearing and to remaining consistent with stature measurements, body mass was determined by femoral head diameter. Although using femoral head diameter has been found insignificant in certain skeletal studies (Ruff, et al., 1991), in clinical studies it achieves greater accuracy in women and young adults (Pomeroy, et al., 2018), the primary focus of this study. For comparison purposes and after Auerbach & Ruff (2004), three methods were compared; Ruff et al., (1991), McHenry (1992) and Grine et al., (1995) (Table 4). The mean of these three methods was then used for comparison as suggested by Auerbach and Ruff (2004) and to determine Body Mass Index.

*Table 4. Equations for femoral head body mass estimation, (from Auerbach and Ruff, 2018).*

| Source | Equation | Sample composition |
|---|---|---|
| **Ruff et al. (1991)** | BM= (2.426 x FH - 35.1) x .90 (females) | Based on data for 80 individuals taken from a population from Baltimore, MD |
| **McHenry (1992)** | BM= 2.239 x FH - 39.9 | Based on 4 sample means of North American males and females, African Pygmies, and Khoisan |
| **Grine et al. (1995)** | BM= 2.268 x FH - 36.5 | Based on 10 sex-specific means for samples of large-bodied African Americans, European Americans, and Native Americans |

#### *5.3.4.1 Body Mass Index*

Both body mass and stature are required to determine Body Mass Index (BMI) which represents the ratio between height and weight as a reflection of health. In clinical studies, BMI can be used to correlate potential mortality rates (Garrouste-Orgeas, et al., 2004) or other indicators of poor health such as heart disease and diabetes (Dixon, et al., 2012). The formula used for determining BMI standardized and is as follows:

$$Body\ Mass\ Index = \frac{Weight\ (in\ kg)}{Height^2\ (in\ m)}$$

### *5.3.5 Puberty*

Puberty assessment followed the methods set out by Shapland and Lewis (2013; 2014) which include assigning a puberty stage based on development of the mandibular canine, cervical vertebrae maturation, distal radius fusion, hamate hook ossification phalanges ossification and iliac crest ossification. A pubertal sign was assigned when 3 or more features associated with pubertal development were aligned.

1- **Pre-puberty** (criteria: mandibular canine stage F or earlier; hamate hook absent; all hand and pelvic epiphyses unfused; CVM stage 1)
2- **Acceleration** (criteria: mandibular canine stage G or H; hamate hook developing; hand epiphyses and epiphyses unfused; CVM stage 2)
3- **Around PHV** (criteria: mandibular canine complete; hamate hook complete; hand epiphyses unfused, except distal humerus and proximal ulna; CMV stage 3)
4- **Deceleration** (criteria: mandibular canine complete; hamate hook complete; hand epiphyses capped; distal radius unfused; iliac crest ossified but unfused; CVM 4-5)
5- **Maturation** (criteria: mandibular canine complete; hamate hook complete; hand epiphyses fusing; distal radius fusing; iliac crest fusing; CVM 5-6)
6- **Post-puberty** (criteria: mandibular canine complete; hamate hook complete; hand epiphyses fused; distal radius fused; iliac crest fusing or fused, CVM 6)

### *5.3.6 Pelvic Typology and Pelvimetry*

Both cohorts were assigned pelvic typology based on visual assessments. Pelvic measurements were taken from the inlet, midplane and outlet to examine pelvic development. Additionally, measurements were taken of the pubic arch including angle and width as the pubic symphysis can also influence potential obstetric hazards.

#### *5.3.6.1 Pelvic Measurements*

Measurements were taken of the pelvic inlet, midplane and outlet (Figure 41) using sliding callipers and a cloth measuring tape.

- **Pelvic inlet (brim area) –** the conjugate is the shortest distance between the pubic symphysis and the sacral promontory. Additionally, the brim was measured using a soft measuring tape along the accurate line of the ilium to determine the circumference.
- **Midplane** –the anteroposterior (conjugate) is taken from the distal edge of the pubic symphysis to the distal edge of the last sacral segment (S5) while the lateral (transverse) is the distance between the ischial spines.
- **Outlet** – the transverse measurement is determined by the distance between the ischial tuberosities.

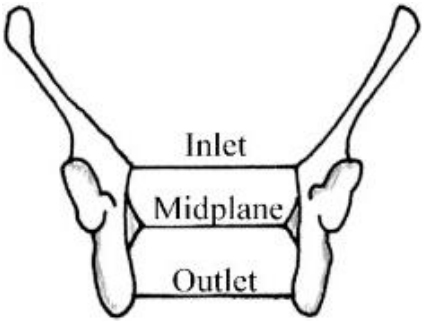



*Figure 41. Pelvic Measurements (from Correia et al, 2004: 155)*

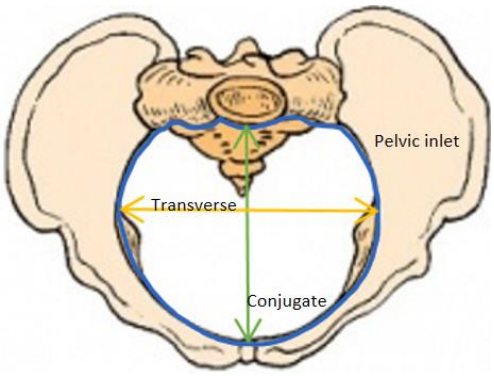



*Figure 42. Pelvic inlet measurements. Transverse is in yellow, conjugate in green and blue represents the pelvic brim.*

Whenever possible the pelvis was articulated for measuring; however, often the pelvis is fragmented in archaeological remains and this is a common limitation of previous studies which require an intact pelvis. In the case of fragmentary pelves, which had a complete pelvic brim, the circumference was determined by measuring each individual fragment of the pelvic brim along the accurate line followed by the first sacral segment and pubic symphysis. While this method requires all sections along the pelvic brim to be present, it allows for a larger sample size. If either the transverse or conjugate could be taken in addition to the circumference, it was then used to determine the corresponding missing measurement. An additional benefit of this method is that it allows for younger individuals who have not completed skeletal development of the pelvis to be included within the sample despite the innominate being unfused.

Pelvic measurements were then compared using two published methods from different perspectives of pelvic development and a approaches to metric mother-fetal relationship, Bull (1949) and modern clinical methods (Cunningham, et al., 2010). Bull (1949), whose work is based on women raised during periods of austerity including the Great Depression and World Wars relies on measurements based on the smallest size a viable fetus would need to successfully navigate the birth canal. This approach also considers the influence modern medical intervention has on current pregnancy and childbirth practices as the minimum size of survivability was determined without modern medical intervention and closely aligns to the resources available in past populations. Cunningham (2010) on the other hand is one of the most popular obstetric textbooks in English speaking countries. It is aimed at future obstetricians and is heavily dependent on modern medical practices. However, it is also from this resource that many countries and hospitals base their birth plans. Any measurement which was lower than those provided by Bull (1949) was assigned as ‘high risk’ and those which fell between Bull (1949) and Cunningham, et al. (2010) place into ‘at risk’ (Table 5).

*Table 5. Obstetric measurements and thresholds for 'high risk' and 'at risk' individuals.*

| Measurement | Bull (1949) | Cunningham, et al. (2010) |
|---|---|---|
| **Inlet- Transverse** | 9.5cm | 12cm |
| **Inlet- Conjugate** | 9.5cm | 10cm |
| **Inlet- Brim Area** | 78 sq. cm | N/A |
| **Midplane- Anteroposterior** | 9.5cm | 11.5cm |
| **Midplane- Lateral** | 9.5cm | 10.5cm |
| **Midplane- Area** | 78 sq. cm | N/A |
| **Outlet** | 7cm | 8cm |
| **Pubic Symphysis Angle** | 75° | N/A |

#### *4.3.1.1 Pelvic Typology*

The development of the pelvis was examined through pelvis typology and a series of metric measurements taken from the pelvic inlet, midplane, and outlet. This was done in both articulated and fragmentary pelvises. Pelvic measurements allowed for the exploration of Developmental Obstetric Disorder (DOJ), Cephalopelvic Disorder (CPD), and to understand rates of obstetric dilemma's caused by a contracted pelvis. The visual assessment focused on the shape of the sacrum and ox coxa, including the relationship between widest point of the transverse and distance from the sacrum, the angle of the accurate line, the angle at which the pelvic brim approached the pubic symphysis and the angle of the pubic symphysis itself, along with the overall shape (Figure 43). Metric measurements by Turner (1885), Thoms (1936), and Bull (1949) were compared (Table 6). Turner (1885) and Bull (1949) provide three pelvic types, while Thoms (1936) adds an additional pelvis shape. In fragmentary pelvises the visual method was only used when the ilium along the accurate line extended past the widest point of the pelvis, roughly above the ischial spine. This allowed the shape of the pubic symphysis to be estimated and the relationship to one of the pelvis typologies assigned.

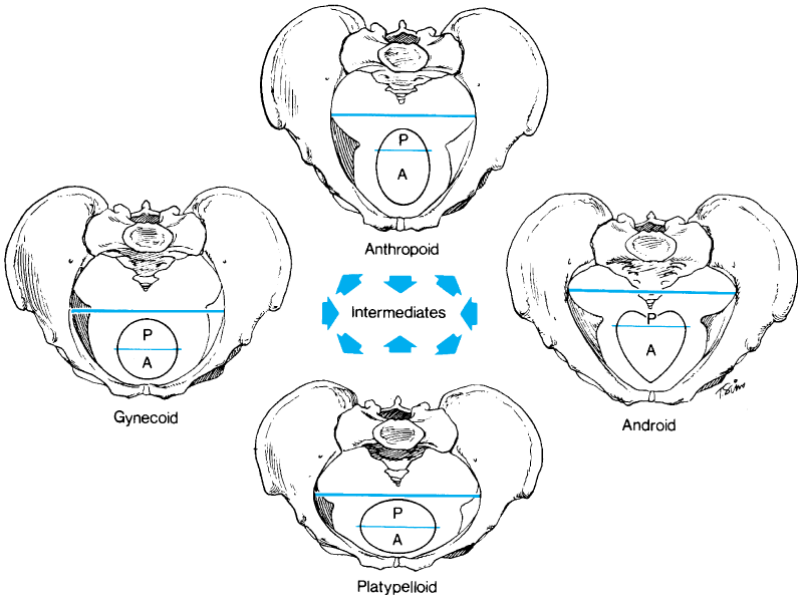



*Figure 43. Four pelvic typologies as developed by Caldwell and Moloy (1933; 1938). From Williams Obstetrics (Cunningham, et al., 2010, p. 63), where A is the anterior space and P is the posterior space in relation to the widest point of the inlet.*

*Table 6. Metric measurements used to determine pelvic typology in mm, AP= Anteroposterior and T= Transverse.*

| Method | Anthropoid | Gynaecoid | Platypelloid | Android |
|---|---|---|---|---|
| **Turner (1885)** | | 90-95 | Brim Index < 90 | Brim Index > 95 |
| **Thoms (1936)** | AP>Transverse | T + 30> AP | T= 10>AP | T= 10>30 of AP |
| **Bull (1949)** | >100 | 85-100 | <85 | |

### *5.3.7 Obstetric Hazards*

Stature plays an important role in the ability to carry a full-term neonate and successfully give birth vaginally. Among modern European populations, women who are less than 150cm have a 49% chance of requiring a caesarean section and were considered 'High Risk', women between 150-154cm were considered 'At Risk' with a intervention rate of 47% and women between 155-159cm were considered 'Low Risk' as this range has a caesarean section rate of 18% (Moller & Lindmark, 1997). Body Mass is also an important indicator of potential obstetric hazards and is often expressed as Body Mass Index, which takes into account both height and mass. Women were sorted into categories based on WHO guidelines (World Health Organization, 2000) (Table 7) and those <18.5 or ≥30 were considered at risk for an obstetric complication due to BMI (Fitzimons, et al., 2009).

*Table 7. Classification of weight status according to BMI (World Health Organization, 2000).*

| Classification | BMI (kg/m$^2$) |
|---|---|
| **Underweight** | <18.5 |
| **Normal/Healthy** | 18.5-24.9 |
| **Overweight** | 25.0-29.9 |
| **Obese I** | 30.0-34.9 |
| **Obese II** | 35.0-39.9 |
| **Obese III** | ≥40 |

### *5.3.8 Skeletal Pathology and Obstetric Hazards*

Metabolic diseases and nutritional deficiencies were examined as they can influence pubertal timing, pelvic morphology, survival rates for pregnancy and childbirth along with providing evidence of the overall health of a population. Cribra orbitalia, which is an indicator of nutrition and general health was scored from 1 to 5 based on criteria set out by Stuart-Macadam (1985; 1991). Within the study, pathology associated with pregnancy and childbirth hazards was divided into three main categories: Developmental or Congenital, Metabolic Diseases, and Joint Diseases which can influence the potential outcome of a pregnancy and childbirth (Table 8). This allowed for a range of pathology to be examined in relation to the influence it may have on pregnancy and vaginal childbirth outcomes.

*Table 8. Pathology Associated with Pregnancy and/or Childbirth.*

| Condition | Description | Complication | References |
|---|---|---|---|
| **Developmental causes:** | | | |
| Nägele's or Robert's pelvis | Absence or underdevelopment of 1 (Nägele's) or both (Robert's) sacral alae. | Instability of pelvic cavity and weak muscles during pregnancy and childbirth. This limits the ability to push during the second stage of labour. | *(Thoms, 1938)* |
| Otto's pelvis (Arthrokatadysis) | The acetabulum is depressed leading to protrusion of femoral head into the pelvis. | Prolonged labour due to dystocia. | *(Crichton & Curlewis, 1962; Muller, 1956)* |
| Symphysis Pubis Dysfunction (SPD) | Excessive movement or absence of the pubic symphysis. | Increased pain and instability of the pelvic region during pregnancy and childbirth. Can occur as a result of pregnancy and can have prolonged debilitating effects. | *(Leadbetter, et al., 2004; Maclennan & Maclennan, 1997; Owens, et al., 2002)* |
| Assimilated pelvis | 6 (high) or 4 (low) vertebral segments in sacrum instead of 5 (standard) | Dystocia or an obstructed pelvis. | *(Tague, 2009)* |
| Sacralisation or lumbarisation | Unilateral or bilateral fusion of the L5 or S1 vertebrae | Dystocia or an obstructed pelvis, instability of muscles during parturition. | *(Diehl & Holmberg, 1968)* |
| Prematurely fused Coccyx | Fusion of the coccyx during reproductive period. | Limits the pelvic outlet resulting in a contracted measurement and can contribute to Dystocia. | *(Tague, 2011)* |

| | | | |
|---|---|---|---|
| Spina Bifida Occulta | A fault in the spinal column where one or more vertebrae fail to form properly. | Complications during delivery including malpresentation due to fixed knee extension and CPD due to a large occipito-frontal circumference. | *(Stark & Drummond, 1970)* |
| Pubic Symphysis Dysplasia (Rupture or Separation) | Separation of more than 10mm or malalignment of the pubic symphysis. | Rupture of the pubic symphysis can occur spontaneously during childbirth while a malalignment can cause instability in the pelvis during pregnancy. | *(Shnaekel, et al., 2015) (Penning, et al., 1996)* |
| Poor sacral curvature | A flat or extremely concave sacrum, outside the expected variation. | Can result in CPD, dystocia or an obstructed pelvis. | *(Cunningham, et al., 2010)* |
| Scoliosis | Lateral curvature of the spine. | Can result in CPD, dystocia and an obstructed pelvis, along with preterm delivery. | *(Restaino, et al., 1996; Visscher, et al., 1988)* |
| **Metabolic diseases:** | | | |
| Kyphoscoliotic pelvis | An anteroposterior curvature of the spine caused by rickets (vitamin D deficiency) | Difficult birthing process due to muscle attachments and potential CPD. | *(Dewhurst, 1953; Thompson & Williams, 2000)* |
| Triradiate pelvic brim | A break within the pelvic brim and funnel-shaped pelvis caused by a softening of the bones due to deficiencies of vitamin D or calcium. | Instability during pregnancy and childbirth, and dystocia or an obstructed pelvis | *(Kaufman, 1995)* |
| Rachitic Deformities of the Pelvis | Twisting or contracting of the pelvis due to softening of the bones. | Can result in CPD, dystocia or an obstructed pelvis. | *(MacLennan, 1944; Wells, 1975)* |
| Osteomalacic Pelvis | A pelvic aperture with a beak-shaped pubic bone. | Can result in CPD, dystocia or an obstructed pelvis. | *(MacLennan, 1944)* |
| **Joint diseases:** | | | |
| Osteophyte Growths (Thoracic, Lumbar, and Sacro-iliac) | Exostosis or abnormal bony growth at joint margins. | Instability or lack of flexibility of the pelvis and can prevent ligaments from stretching during childbirth. | *(Vleeming, et al., 2012)* |
| Lumbar Spondylolisthesis | The forward displacement of one vertebra in relationship to an adjacent vertebra. | Can result in CPD, dystocia or an obstructed pelvis. Also can result in extreme pain during pregnancy. | *(Cholewicki, et al., 2017)* |
| Kyphosis (Thoracic, Lumbar and Sacral) | Curvature of lower back. | Results in various obstetric complications including malpresentation and an obstructed pelvis. | *(Chau & Lee, 1970)* |
| Schmorl Nodes | A lesion located on a vertebral body. | Can be the result of pregnancy and lead to back pain. | *(Owsley & Bradtmiller, 1983)* |

### *5.3.9 Statistical Analysis*

A 99.5% minimum confidence limit was adhered to for all statistical tests.

For statistical analysis non-parametic, including Pearsons Chi-square tests, were performed using Microsoft Excel 2016. Kruskal-Wallis one-way ANOVA was conducted in SPSS 24.

# 6 RESULTS

A total of 436 females from 26 sites relating to 11 Romano-British urban centres were analysed to determine their physical development throughout the life course. Osteological information was gathered for age, sex, pelvis typology and development, stature and body mass. Additionally, evidence of non-specific infections, trauma, nutritional deficiencies, and other pathological changes associated with ageing were noted. Demographics includes sexing and ageing results. As some sections required testing of methods prior to the formal results, the results derived from testing multiple methods to determine the best for analysis are presented next. This is followed by the first cohort of those aged between 10.0-24.9 years who were examined for pubertal timing. Next, the second cohort of those between 13.0-44.9 years of age, was examined for potential childbirth complications. Lastly, both cohorts were independently examined separately for pelvic development, stature, and body mass.

## 6.1 DEMOGRAPHICS

The sample was divided into nine age categories that reflected key transitions in the Roman female life course identified from both historical literature and physical development (Figure 44; Appendix ii). Of the 436 females assessed, the majority (60.09%, n=262) fell into the main reproductive period covering 20.0-34.9 years at death. Among non-adults aged 10.0-17.9 based on dental development and vertebral ring fusion, the largest age category was 10.0-12.9 (n=34). The lowest number of females (n=9) were estimated to be 18.0-19.9 years of age as determined by a dental development, vertebral ring fusion, and sacral fusion. The number of individuals in the older age categories of 35.0-39.9 and 40.0-44.9 decreased as they approached menopause the secession of their reproductive period.

*Figure 44. Number of individuals by age category.*

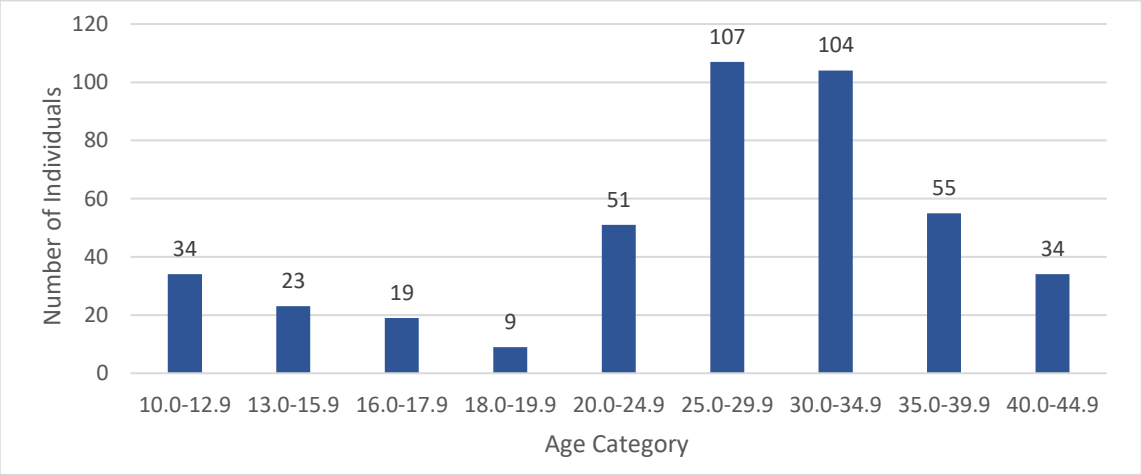
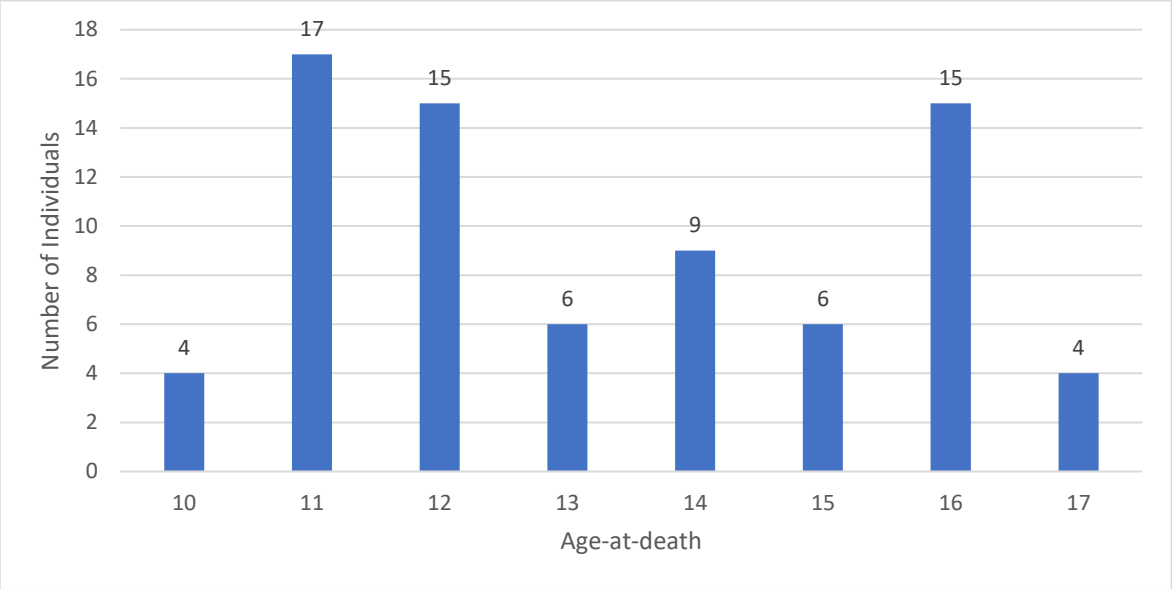


*Figure 45. Non-adult ageing, complete sample in 1-year groups based on mean dental age.*




When the mortality profile of the non-adults (10.0-17.9) from the all sites (n=75) are compared using one-year age categories derived from dental development, there was a greater number of 11, 12 and 16-year-olds (Figure 45).

## 6.2 Results of Methods Testing

Prior to determining the main body of results, various methods were tested to determine the best options for determining potentially controversial topics. These initial tests including testing sex methods used for non-adult populations, comparing body mass equations and metric verses visual assessment of pelvis typology.

### *6.2.1 Sex determination of non-adults*

Sex determination of cranial and post-cranial indicators including the distal humerus and greater sciatic notch was carried out to ensure only females were included within the sample. Sex was assigned as female or possible female when three or more traits aligned. This resulted in 18 possible females and 118 females. Given sex estimation of individuals under the age of 17 is considered problematic (Lewis, et al., 2016), the agreement of these individual features was analysed. Consistency across features varied among those determined to be females or possible females. Prior to 15.9 years of age, cranial features showed the greatest variation with minimal difference between the number of individuals scored male (37%; n=17) and female (63%; n=29). Within the 10.0-12.9 age group, 44.8% (n=13) presented with a 'male' dental arcade; this was the only indicator which fell below the 70% threshold. The dental arch provided the most consistent results with 93.6% (n=44) presenting as female. Post-cranial traits proved more

consistent in their agreement of female features. Unlike cranial traits, where age seemingly affected morphology, the sex estimation based on the pelvis and humerus remained consistent through all non-adult age ranging from 95.6% (n=21) for greater sciatic notch depth to 100% among 13.0-15.9-year-olds to 100% (n=17) using olecranon shape.

### *6.2.2 Body Mass*

The mean body mass was determined for 268 individuals (Figure 46) based on three separate methods: Ruff (1991), McHenry (1992) and Grine (1995). The method suggested by McHenry tended to provide higher values for body mass and ranged from 35.85kg to 70.03kg, while Ruff had a much lower range from 42.27kg to 75.61kg. However, it was the Grine method with a range from 40.23kg to 74.86kg which was used for comparison as it provided results between Ruff and McHenry.

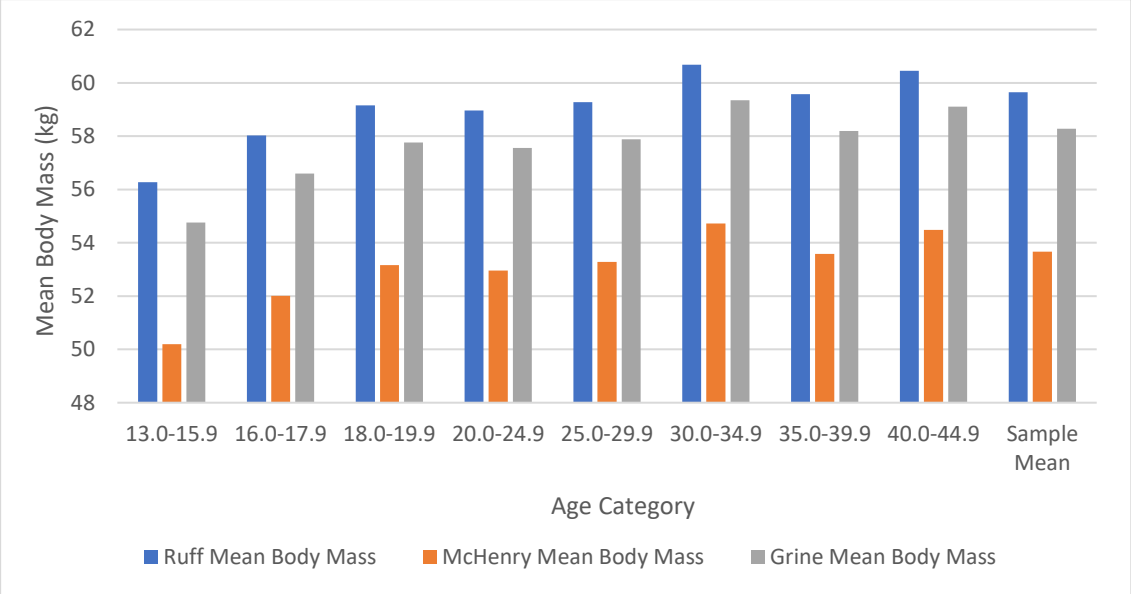



*Figure 46. Mean body mass comparison of methods by age.*

### *6.2.3 Pelvis Typology*

The pelvic shape of 389 females was assessed using the four most popular methods (Figure 47). Thoms' (1936) and Turner's (1885) metric methods and the visual method were the only ones to identify an android pelvis, while Turner's (1885) and Bull's (1949) methods had a greater percentage of platypelloid shapes. Results from the visual method were more in line to the results seen in modern populations, with the gynaecoid shape being the most common. In addition, Thom's method has been shown to overestimate the android type (Delprete, 2017). As a result, the visual method was used for further analysis of pelvic shape.

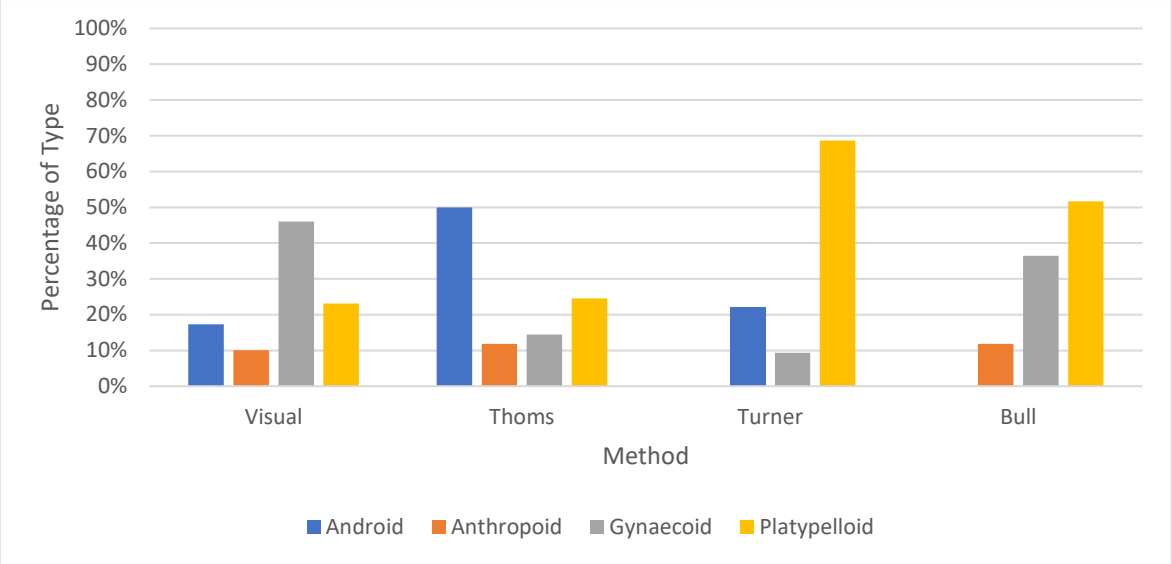



*Figure 47. Comparison of pelvis typology methods.*

Across all age groups, the gynaecoid type was the most frequent shape recorded (Figure 48). The android type pelvis was more common in the younger age categories and peaked in the 18.0-19.9-year age group (42.9%; n=3/7). There was a slight shift in morphology among older individuals resulting in higher rates of android shaped pelvis types. Overall, the gynaecoid shape was the most common (74.4%; n=184), followed by platypelloid (24.5%; n=95), android (17.8%; n=69) and anthropoid (10.3%; n=40).

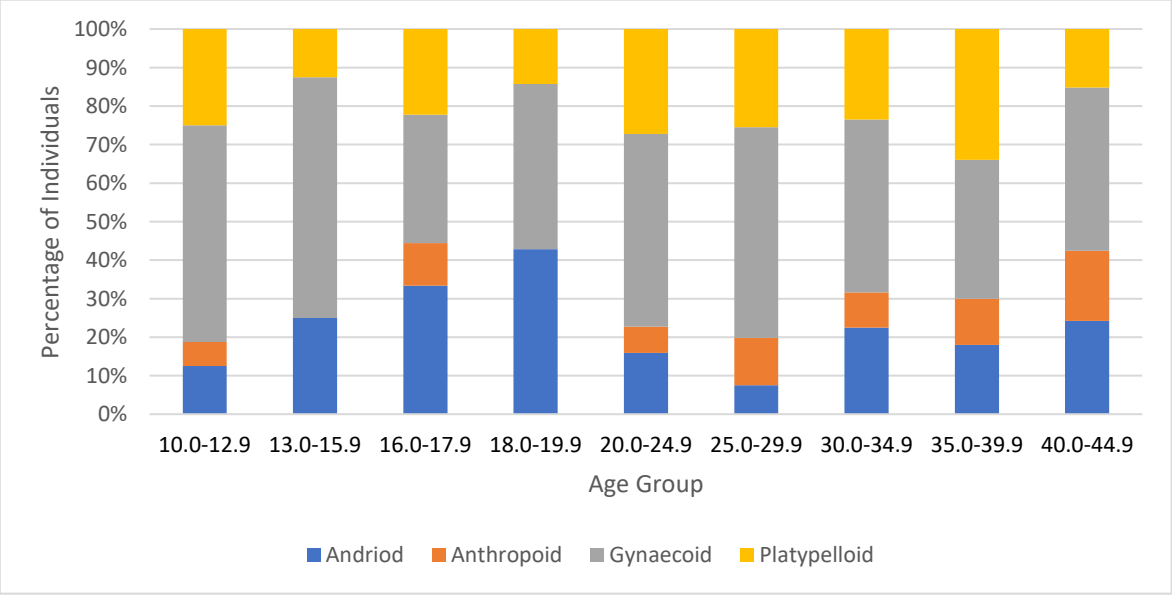



*Figure 48. Assigned pelvis typology, by age group.*

## 6.3 Life course Analysis- Puberty in Roman Britain

A cohort of 141 females aged 10 to 25 years were examined to assess the age at which females moved through specific puberty stages (Table 9). These ages were selected based on previous puberty studies (Lewis, et al., 2016). Individuals between 10 and 17 years are provided in one-year categories derived from mean dental ages. The majority of individuals (n=74; 52.4%) within this subsample were from Durnovaria (Dorchester) and Venta Belgarum (Winchester).

*Table 9. Age profile of the Puberty sub-sample*

| Site | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18.0-19.9 | 20.0-24.9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dorchester** | 0 | 3 | 6 | 4 | 3 | 3 | 4 | 1 | 4 | 18 | 46 |
| **Ancaster** | 0 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 6 | 12 |
| **Ashton** | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 5 |
| **Cirencester** | 0 | 3 | 2 | 1 | 0 | 0 | 0 | 1 | 1 | 2 | 10 |
| **Colchester** | 0 | 1 | 5 | 1 | 2 | 0 | 1 | 0 | 1 | 3 | 14 |
| **Baldock** | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | 7 |
| **Winchester** | 1 | 4 | 0 | 0 | 2 | 0 | 6 | 0 | 1 | 14 | 28 |
| **Gloucester** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| **Ilchester** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| **Dorchester-upon-Thames** | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 4 | 11 |
| **Bicester** | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 4 |
| **Total** | **4** | **17** | **15** | **6** | **9** | **6** | **15** | **4** | **9** | **56** | **141** |

### *6.3.1 Pubertal Timing*

A total of 136 individuals were assigned a puberty stage (Table 10, Figure 49) based on three or more features aligning. The average age of individuals in the Initiation Stage (n=14) was 11.6 years based on the mean of all available mandibular teeth (Demirjian, et al., 1973; Moorrees, et al., 1963; Smith, 1991). The majority of 10 to 13-year olds had entered the Acceleration Stage (n=24; 57.1%) and the mean age for this stage was 12.1 years. Although two individuals, both aged 11 years had reached the Transition or PHV Stage, the average age of individuals reaching this stage was 14.1 (n=11). Menarche occurs once PHV is reached but prior to the phalangeal epiphyses fusing and is associated with the ossification of the iliac crest. Among Romano-British women, menarche occurred between the ages of 11 and 16 years of age with a mean age of 14 years. Deceleration primarily occurred in individuals between 13.3 and 17.7 years at death with a mean age of 16 years (n=15). Females between the ages of 14.1 years to 24.9 were found within the Maturation stage (n=19). No individual had reached Completion prior to the 15.2 years of age (n=53), while it was the most common stage among the 18.0-19.9 (66.7%) and 20.0-24.9 (79.1%) age categories. Within the larger sample ranging from 10.0-44.9, no individuals above 25 years of age were noted to be in the Maturation stage.

*Table 10. Mean age and age range of puberty subsample.*

| Stage | Number | Mean Age | Age Range |
|---|---|---|---|
| Initiation | 14 | 11.6 years | 10.6-12.6 |
| Acceleration | 24 | 12.1 years | 10.3-13.5 |
| Transition (PHV) | 11 | 14.0 years | 11.1-16.5 |
| Deceleration | 15 | 16.0 years | 13.3-24.9 |
| Maturation | 19 | 19.3 years | 14.1-24.9 |
| Completion | 53 | 21.5 years | 15.2-24.9 |

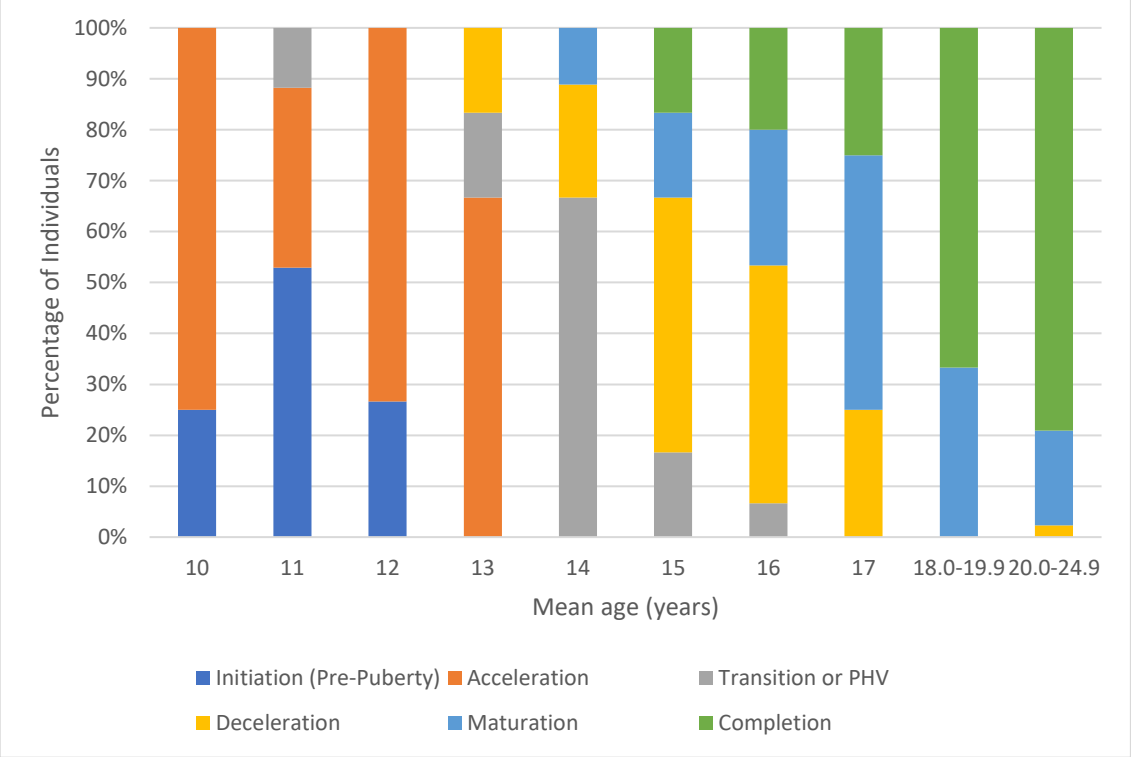



*Figure 49. Pubertal stage of observed individuals by age-at-death.*

A total of 76 individuals aged 10.0 to 18.6 were plotted to create a linear regression line; this resulted in an equation of $y$=0.59$x$-5.2, where $y$ is the pubertal stage and $x$ is age {Puberty Stage= 0.59(Age)-5.2} (Figure 50). The mean age of the sub-sample was 13.8 and the mean pubertal stage was 3, or Transition Stage. The variability, particularly for stage 3 which spans from 11 to 16 years, shows the range of early and late developers.

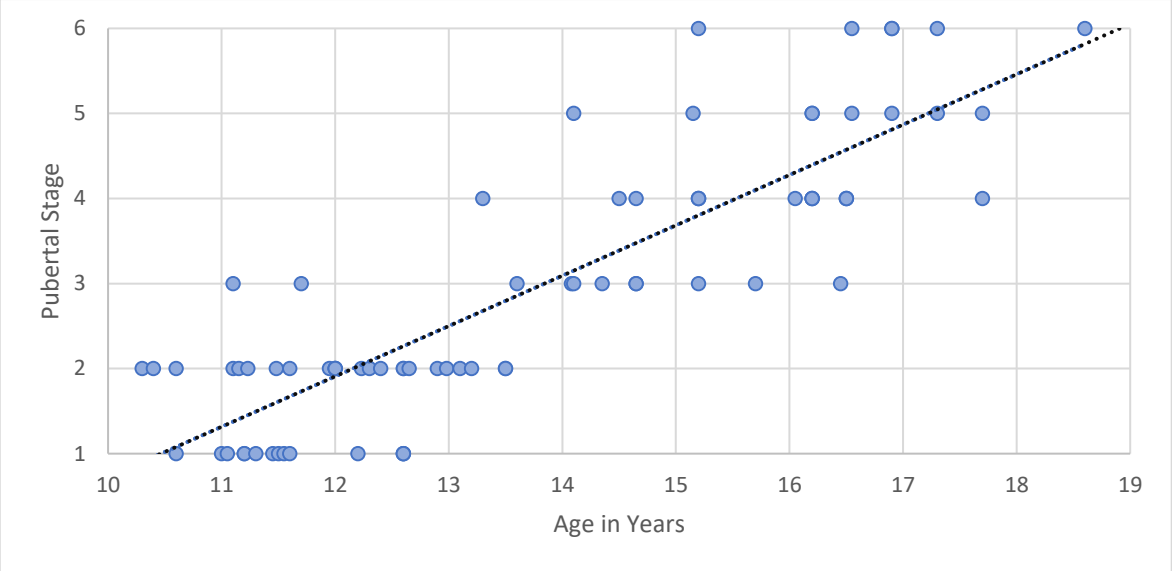



*Figure 50. Plot of specific ages based on dentition and puberty stage. Stage 1 is Initiation, Stage 2 is Acceleration, Stage 3 is Transition, Stage 4 is Deceleration, Stage 5 is Maturation and Stage 6 is Completion. Linear regression equation is {y=0.59x-5.2}.*

#### *6.3.1.1 Precocious Puberty*

Also referred to as early onset puberty, precocious puberty occurs when an individual develops pubertal traits two years ahead of the mean age group. Within the sample two individuals from separate sites reached the Transition or PHV stage early, at 11.1 and 11.7 years. Neither individual presented with pathological conditions that may have influenced pubertal timing, although the second individual, from Ashton (Skeleton AS138), had sacralisation with fusion of L5.

#### *6.3.1.2 Delayed Puberty*

As with precocious puberty, delayed puberty takes place when the Initiation or Completion of puberty is later than the mean age group. One individual, a female from Stane Street in Baldock, is the only 20.0-24.9-year-old found to be in the Deceleration stage. This placed them behind the expected level of Maturation for Romano-British females as 97.7% (n=42/43) of the age group had reached Maturation or Completion. This individual (Skeleton SS7538), displayed a range of morphological and pathological changes that may have hindered her development or signalled a more serious pathological condition including spina bifida occulta and unilateral sacralisation resulting in an uneven sacral ala.

### *6.3.2 Pelvic Development*

The shape and size of the pelvis play a key role in the development process. Based on the shape of the pelvic inlet, midplane and outlet, 51 individuals with dental ages of 10.3 and 18.6 years were assigned to one of the four pelvic typology groups (Table 11). A gynaecoid pelvis was the most common type in this group (49%) and the anthropoid was the least common at (5.9%).

*Table 11. Pelvis Type, by age. Percentage represents the rate within the age group.*

| Age (years) | N | Gynaecoid | Platypelloid | Anthropoid | Android |
|---|---|---|---|---|---|
| 10 | 1 | 1 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 11 | 8 | 3 (37.5%) | 3 (37.5%) | 1 (12.5%) | 1 (12.5%) |
| 12 | 9 | 5 (55.6%) | 2 (22.2%) | 0 (0%) | 2 (22.2%) |
| 13 | 5 | 3 (60%) | 0 (0%) | 0 (0%) | 2 (40%) |
| 14 | 6 | 4 (66.7%) | 1 (16.7%) | 0 (0%) | 1 (16.7%) |
| 15 | 3 | 3 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |
| 16 | 14 | 6 (42.9%) | 3 (21.4%) | 1 (7.1%) | 4 (28.6%) |
| 17 | 4 | 0 (0%) | 1 (25%) | 1 (25%) | 2 (50%) |
| 18 | 1 | 0 (0%) | 1 (100%) | 0 (0%) | 0 (0%) |
| **Total** | **51** | **25 (49%)** | **11 (21.6%)** | **3 (5.9%)** | **12 (23.5%)** |

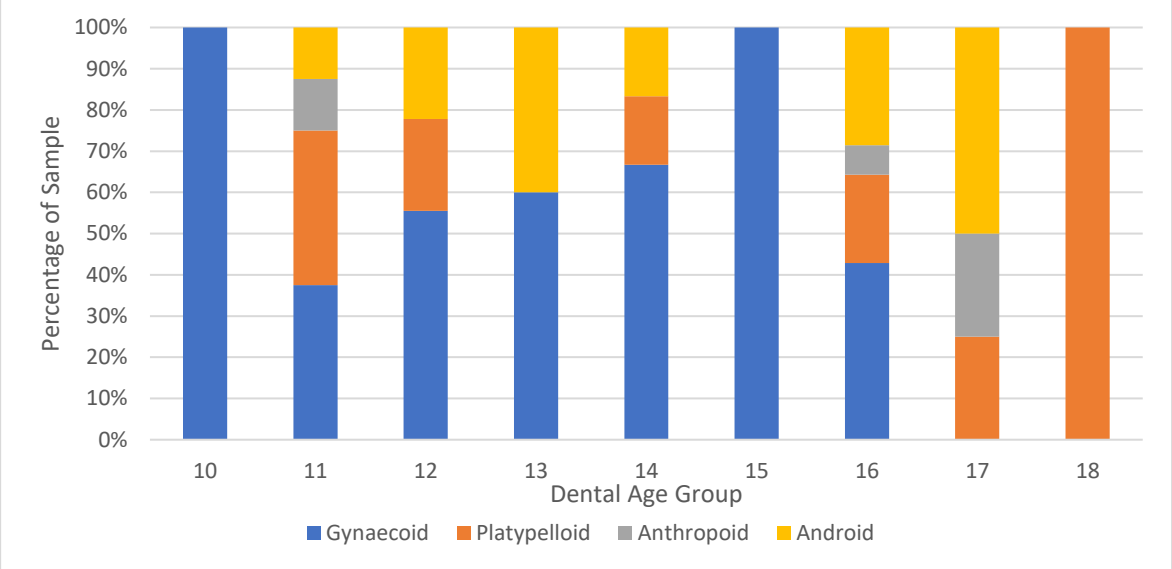



*Figure 51. Percentage of pelvis type, by mean dental age.*

### *6.3.2.1 Pelvic Morphology and Puberty*

Females with estimated puberty stage and pelvis (n=103) were examined by pelvic morphology type (Table 12, Figure 51). The gynaecoid type was the most common (49.5%; n=51) while only 5.8% (n=6) were assigned to the anthropoid group. Although the sample size is small, the majority of females in the Acceleration group (63.4%; n=7) had a gynaecoid pelvis type compared to 18.2% (n=2) in the platypelloid group. Once PHV is reached, the gynaecoid pelvis rises to 75% (n=6) while in the later stages the anthropoid pelvis type reappears.

*Table 12. Pelvis typology, by puberty stage. Percentage represents the range within the pubertal stage.*

| Stage | N | Gynaecoid | Platypelloid | Anthropoid | Android |
|---|---|---|---|---|---|
| Initiation | 7 | 2 (28.6%) | 3 (42.9%) | 1 (14.3%) | 1 (14.3%) |
| Acceleration | 11 | 7 (63.4%) | 2 (18.2%) | 0 (0%) | 2 (18.2%) |
| Transition (PHV) | 8 | 6 (75%) | 1 (12.5%) | 0 (0%) | 1 (12.5%) |
| Deceleration | 12 | 4 (33.3%) | 4 (33.3%) | 0 (0%) | 4 (33.3%) |
| Maturation | 19 | 9 (47.4%) | 4 (21.1%) | 3 (15.8%) | 3 (15.8%) |
| Completion | 46 | 23 (50%) | 10 (21.7%) | 2 (4.3%) | 11 (23.9%) |
| **Total** | **103** | **51 (49.5%)** | **24 (23.3%)** | **6 (5.8%)** | **22 (21.4%)** |

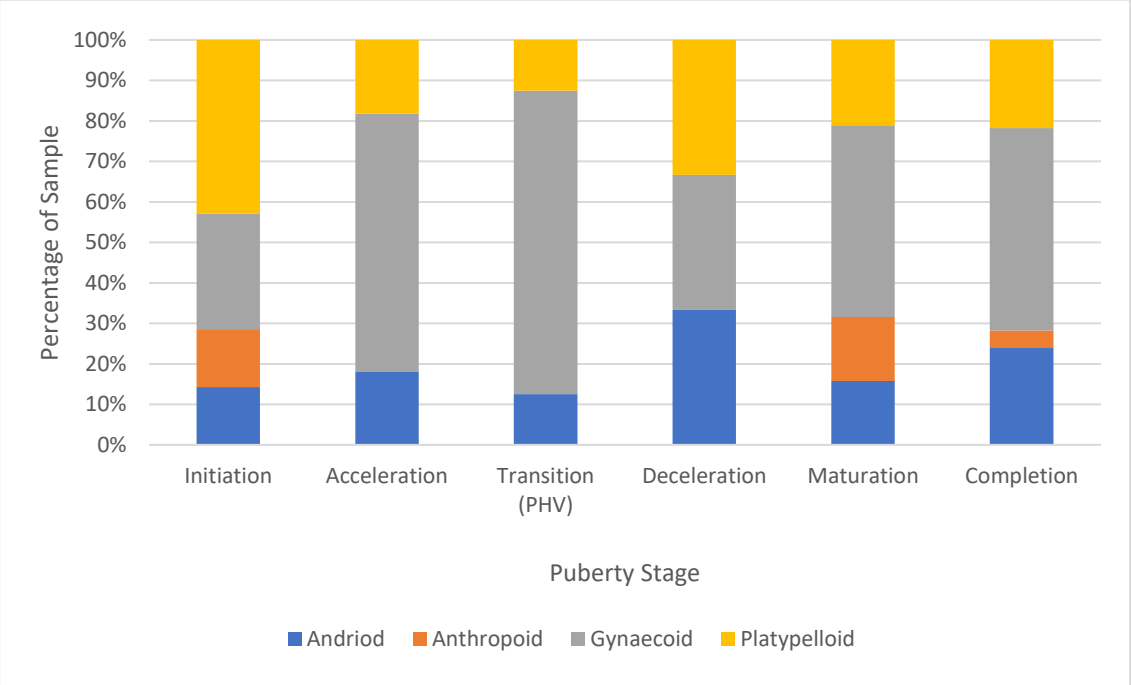



*Figure 52. Percentages of each pelvis typology, by puberty stage.*

#### 6.3.2.1.1 Pelvic Size and Puberty

The size of the pelvic inlet, midplane and outlet directly relate to the ability to successfully give birth vaginally. If these key areas are too small, it can be impossible for a fully developed fetus to pass through into the birth canal. Within the puberty subsample 78 individuals from 10.0 to 24.9 years were examined for pelvic size at these three key areas the inlet, midplane and outlet.

#### 6.3.2.1.2 Pelvic Inlet

The inlet transverse measurement was taken in 49 females. When examined by age the mean size of the transverse increases until the 18.0-19.9 age group (Table 13). This is further supported by the rate of contraction found among the puberty sub-sample when divided by puberty stage which decreases from 83.3% (n=5/6) for the Initiation stage to 57.1% (n=4/7);

however, the contraction rate is much lower among the Deceleration (n=1/10), Maturation (n=0/13), and Completion (n=1/28) stages (Table 14).

*Table 13. Inlet Transverse measurements (mm), by age.*

| Age (years) | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| 10 | 1 | 1 | 100% | 79.9 | 79.9 | 79.9 |
| 11 | 8 | 6 | 75% | 90.3 | 80.2 | 105.2 |
| 12 | 8 | 7 | 87.5% | 88.4 | 77.1 | 95.11 |
| 13 | 4 | 2 | 50% | 102.3 | 86.1 | 123.4 |
| 14 | 6 | 2 | 33% | 102.3 | 85.8 | 108.6 |
| 15 | 0 | . | . | . | . | . |
| 16 | 10 | 2 | 20% | 113.5 | 91.1 | 137.9 |
| 17 | 4 | 0 | 0% | 116.5 | 106.2 | 124.7 |
| 18.0-19.9 | 5 | 0 | 0% | 124.1 | 118.8 | 130.5 |
| 20.0-24.9 | 30 | 1 | 3.3% | 122.4 | 89.9 | 138.5 |

*Table 14. Inlet Transverse measurements (mm), by puberty stage.*

| Puberty Stage | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| **Initiation** | 6 | 5 | 83.3% | 90.85 | 83.2 | 105.2 |
| **Acceleration** | 12 | 9 | 75% | 88.4 | 77.1 | 100.3 |
| **Transition (PHV)** | 7 | 4 | 57.1% | 96.6 | 85.8 | 114.2 |
| **Deceleration** | 10 | 1 | 10% | 111.1 | 94.4 | 129.5 |
| **Maturation** | 13 | 0 | 0% | 125.2 | 113.7 | 137.9 |
| **Completion** | 28 | 1 | 3.6% | 121.6 | 89.9 | 138.5 |

The inlet conjugate was taken from 27 pelvises and found to be contracted in 6 (22.2%) (Table 15). In the Deceleration group the rate of contraction is 80% (n=4/5), which is higher than the rate of contraction rate for the Transverse Inlet measurement (10%; n=1/10) within the same group. Similar to the Transverse Inlet, by the Maturation stage no individuals were found to have a contracted measurement (n=6), although this raises to 15% (n=2/13) for the Completion group (Table 16).

Despite the inlet conjugate and transverse measurements influencing the likelihood of a contracted pelvis, it is the pelvic brim area which is the strongest indicator of a truly contracted pelvis due to the ability for the neonate to rotate and use all available pelvic inlet space (Table 17). From Initiation to the Transition stage the pelvic brim area is contracted in all individuals (n=5), while there are no contracted measurements within the Maturation group. However, this rises to 7.7% (n=1/13) within the Completion group (Table 18).

*Table 15. Inlet Conjugate measurements (mm), by age.*

| Age (years) | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| 10 | . | . | . | . | . | . |
| 11 | 1 | 1 | 100% | 58.2 | 58.2 | 58.2 |
| 12 | 2 | 0 | 0% | 88.6 | 98.9 | 100.4 |
| 13 | 1 | 1 | 100% | 86.9 | 86.9 | 86.9 |
| 14 | 2 | 1 | 50% | 97.7 | 93.3 | 102 |
| 15 | . | . | . | . | . | . |
| 16 | 3 | 2 | 66.7% | 110.4 | 84.1 | 158.6 |
| 17 | . | . | . | . | . | . |
| 18.0-19.9 | 1 | 0 | 0% | 124.6 | 124.6 | 124.6 |
| 20.0-24.9 | 17 | 1 | 5.9% | 112 | 91.9 | 149.6 |

*Table 16. Inlet Conjugate measurements (mm), by puberty stage.*

| Puberty Stage | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| **Initiation** | 1 | 1 | 100% | 58.2 | 58.2 | 58.2 |
| **Acceleration** | 2 | 0 | 0% | 88.6 | 98.9 | 100.4 |
| **Transition (PHV)** | 1 | 0 | 0% | 102 | 102 | 102 |
| **Deceleration** | 5 | 4 | 80% | 75.3 | 86.9 | 107.8 |
| **Maturation** | 6 | 0 | 0% | 122.3 | 104.8 | 158.6 |
| **Completion** | 13 | 2 | 15% | 110 | 84.1 | 149.6 |

*Table 17. Brim Area (cm), by age.*

| Age (years) | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| 10 | . | . | . | . | . | . |
| 11 | 1 | 1 | 100% | 48.1 | 48.1 | 48.1 |
| 12 | 2 | 2 | 100% | 63.8 | 60.8 | 66.9 |
| 13 | . | . | . | . | . | . |
| 14 | 2 | 1 | 50% | 75.4 | 71.3 | 79.5 |
| 15 | . | . | . | . | . | . |
| 16 | 3 | 1 | 33.3% | 109.1 | 73.71 | 171.7 |
| 17 | . | . | . | . | . | . |
| 18.0-19.9 | | | | | | |
| 20.0-24.9 | 17 | 1 | 5.9% | 106.5 | 75.13 | 130.41 |

*Table 18. Brim Area (cm), by puberty stage.*

| Puberty Stage | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| **Initiation** | 1 | 1 | 100% | 48.1 | 48.1 | 48.1 |
| **Acceleration** | 2 | 2 | 100% | 63.8 | 60.8 | 66.9 |
| **Transition (PHV)** | 1 | 1 | 100% | 71.3 | 71.3 | 71.3 |
| **Deceleration** | 4 | 1 | 25% | 85.6 | 73.7 | 104.9 |
| **Maturation** | 6 | 0 | 0% | 122.9 | 95.1 | 171.7 |
| **Completion** | 13 | 1 | 7.7% | 103.8 | 75.13 | 128.3 |
| **Total** | 27 | 6 | 22.2% | 82.6 | 48.1 | 171.7 |

#### 6.3.2.1.3 Pelvic Midplane

Two individuals, both within the Completion stage, presented with contracted midplane anterior-posterior or conjugate measurements. Similarly, only a single individual also from the Completion stage had a contracted midplane lateral or transverse measurement (n=1/13). When the anterior-posterior and lateral midplane measurements were used to determine the midplane area, no individuals in any age group or puberty stage presented with a contracted midplane area.

#### 6.3.2.1.4 Rate of Pelvic Contraction and Puberty

The rate of contracted pelvic measurements within the subsample group showed a decline with development (n=78) (Table 19, Figure 53). However, within the 20.0-24.9 and Completion groups the rate of contraction rises to 18.5% (n=5/27) and 26.7% (n=8/30) respectively placing both groups near the estimated expected rates of pelvic contraction among modern populations (20%) (Cunningham, et al., 2010).

*Table 19. Rate of Pelvic Contraction (any measurement), by age.*

| Age (years) | N | Contracted | Rate of Contraction |
|---|---|---|---|
| 10 | 1 | 1 | 100% |
| 11 | 8 | 7 | 87.5% |
| 12 | 8 | 6 | 75% |
| 13 | 5 | 3 | 60% |
| 14 | 6 | 3 | 50% |
| 15 | 1 | 1 | 100% |
| 16 | 10 | 5 | 50% |
| 17 | 4 | 0 | 0% |
| 18.0-19.9 | 8 | 0 | 0% |
| 20.0-24.9 | 27 | 5 | 18.5% |

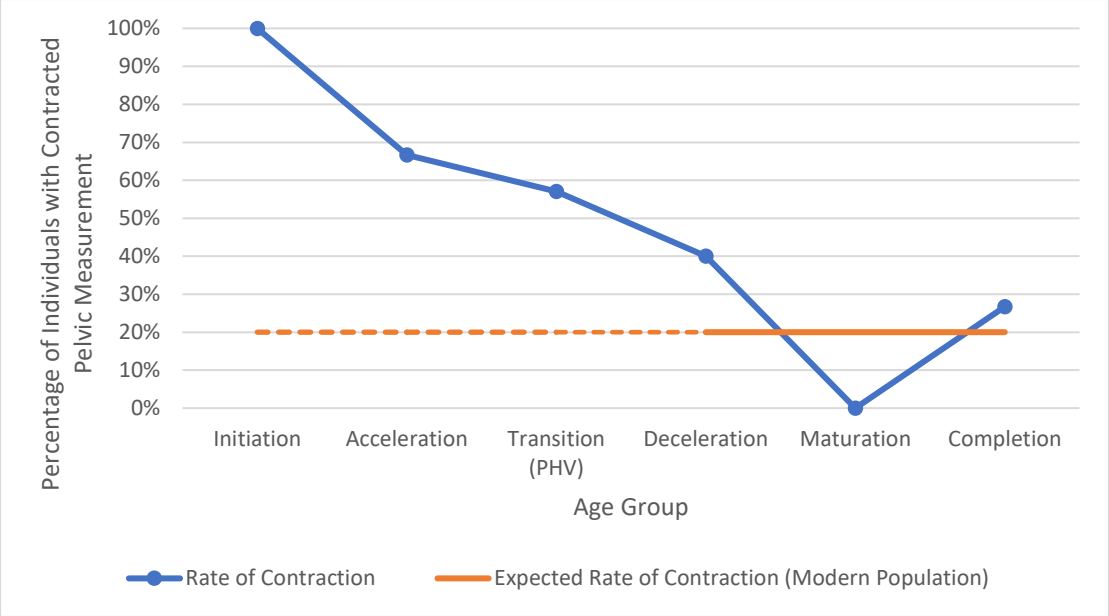



*Figure 53. Rate of pelvic contraction (any measurement), by puberty stage. Expected rate of contraction in modern populations among women who have reached menarche. Dashes represent the expected rate of contraction among women have not reached menarche.*

### *6.3.3 Stature, Body Mass and Body Mass Index*

Both height and body mass were calculated for individuals between the ages of 13.0 and 24.9 years with fused femoral epiphyses (n=53 and 60, respectively) using Trotter and Glesen (1952) formula for white females. Femoral length ranged from 35.9cm to 46.2cm with a mean of 41.2cm. The puberty sub-sample ranged from a minimum height of 142.7cm ± 3.72cm to a maximum of 168.21 ± 3.72cm with a mean of 155.8cm. Stature, based on femoral length, along with femoral head diameter was then used to determine Body Mass (BM) and Body Mass Index (BMI).

Body mass (n=57) was calculated and produced mean of 56.1kgs for individuals between the ages of 13.0 and 24.9 years at time of death (Table 20, Figure 54). When compared to the modern mean body mass for girls between the ages of 13.0 and 20.0 the sample group is much lower; however, this does not take into consideration the stature differences between modern populations and the Roman subsample. This makes the BMI, which takes into the consideration between stature and weight, helpful for comparison purposes. Additionally, this sample represents the non-survivors which can be important when discussing stature, body mass and BMI as non-survivors may have been ill, had a different diet or varied life experience from the 'norm'.

*Table 20. Mean Body Mass, by age.*

| Age (years) | N | Mean BM | Std. Deviation |
|---|---|---|---|
| 13 | 1 | 56.6kg | . |
| 14 | 1 | 56.2kg | 5.4 |
| 15 | 3 | 51.2kg | 3.2 |
| 16 | 3 | 49.9kg | 7.1 |
| 17 | 6 | 57.1kg | 5.8 |
| 18.0-19.9 | 7 | 57.6kg | 3.5 |
| 20.0-24.9 | 38 | 56.5kg | 5.0 |
| **Sample Mean** | **57** | **56.1kg** | **7.1** |

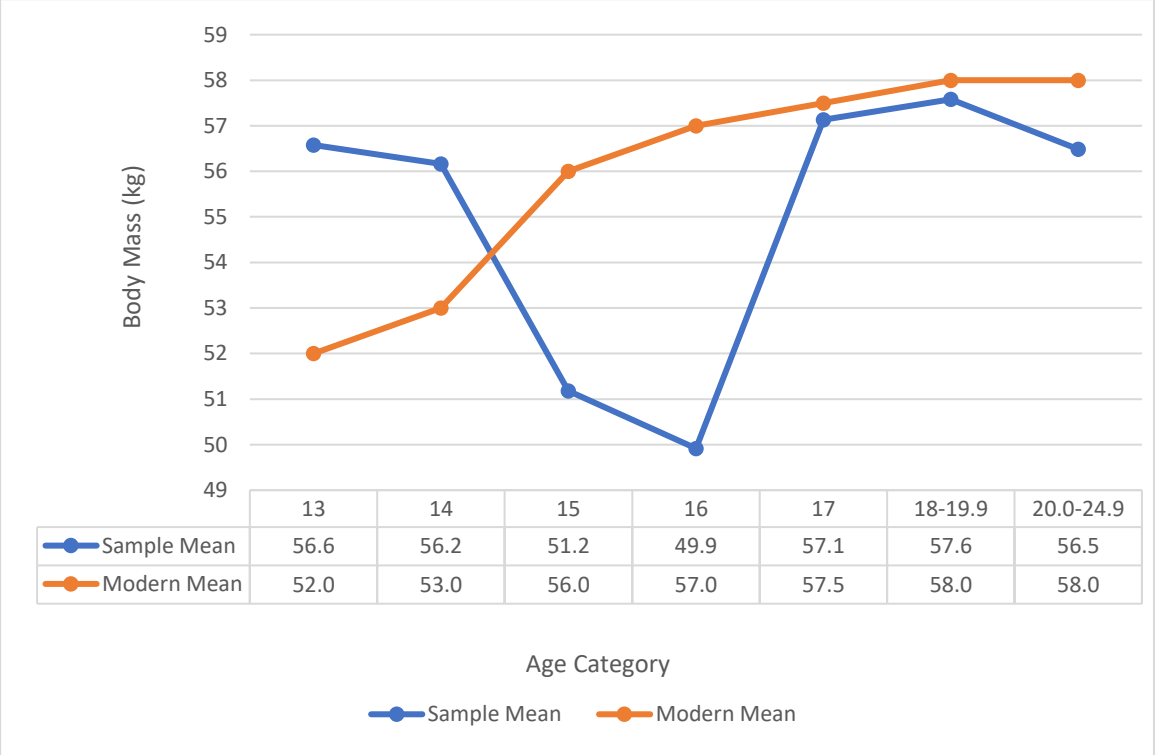



*Figure 54. Body Mass (kg) by Age Category.*

A Body Mass Index (BMI) was determined for 53 individuals aged 18.7 to 24.9 with a sample mean of 22.93 years. Compared to modern medical standards 28% (n=15/53) were overweight, 70% (n=37/53) were healthy and one individual underweight (Table 21). On average the subsample was above the 75th percentile based on modern methods (Figure 55). The individual with the lowest BMI (18.6), a female from Ancaster (AN185) aged 20.0-24.9 years and in the Maturation puberty stage. With a stature of 167.0cm they would be considered underweight today. This individual had healed cribra orbitalia and pubic symphysis dysplasia. At the other end of the spectrum, a female aged 14.1 years from Poundbury Camp (PC127) had a BMI of 27,

a stature of 149.2cm, and was in the Deceleration pubertal stage. This individual would be on the border of overweight and obese against modern standards for 14-year olds both for age and height. There was no evidence of pathology which would indicate a metabolic disease or trauma to account for the higher than average BMI. Additionally, the burial followed a consistent pattern for the site, with a coffin and no grave-goods; therefore, there is no evidence of this individual being from a different social class. The youngest overweight female, aged 13, also from Poundbury Camp (PC794B), had a BMI of 24.2 and a prematurely fused coccyx. Among the age groups, the 20.0 to 24.9-year group had the highest rate of overweight individuals which may be linked to skeletal changes that could hinder mobility including thoracic and lumbar osteophytes (30%; n=3/10) and an uneven sacral ala (20%; n=2/10).

*Table 21. Body Mass Index, by age.*

| Age (years) | N | Underweight | Healthy | Overweight |
|---|---|---|---|---|
| 13 | 1 | . | . | 1 |
| 14 | 3 | 0 | 2 | 1 |
| 15 | 1 | . | . | 1 |
| 16 | 8 | | 7 | 1 |
| 17 | 2 | | 2 | |
| 18.0-19.9 | 4 | | 3 | 1 |
| 20.0-24.9 | 34 | 1 | 23 | 10 |

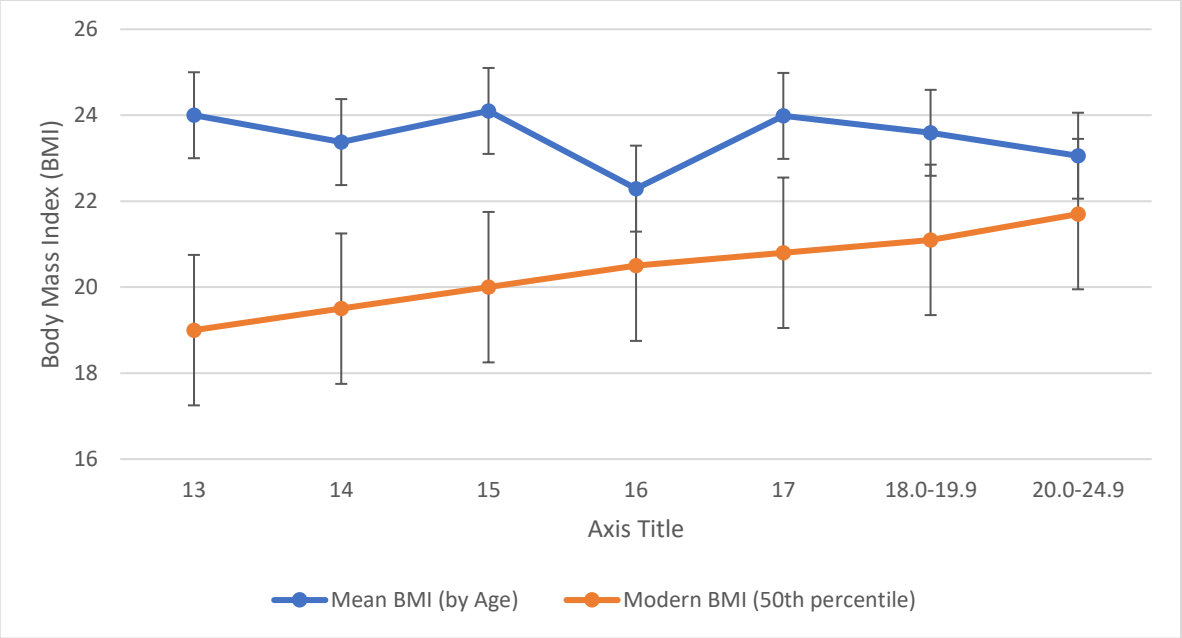



*Figure 55. Mean BMI of subsample compared to Modern BMI data at 50th percentile. Error bars on the Mean BMI represent the ± 3.72cm error rate in stature while the Modern BMI represents the 25th and 75th percentiles.*

#### 6.3.3.1.1 Body Mass Index and Puberty

The mean Body Mass Index (BMI) was also compared to puberty stage (Table 21, Figure 56). For the Transition Stage (n=1) the mean BMI was 23.51. Although this individual is classified as overweight, the higher than expected BMI remained constant. Throughout the other groups the mean BMI for Maturation was 23.2 (n=11), Deceleration 23.2 (n=8) and Completion 22.9 (n=33). As an individual approached Completion from Transition the mean BMI drops from 23.5 to 22.9.

*Table 22. Body Mass Index, by puberty stage.*

| Puberty Stage | N | Underweight | Healthy | Overweight |
|---|---|---|---|---|
| Initiation | 0 | . | . | . |
| Acceleration | 0 | . | . | . |
| Transition/PHV | 1 | 0 | 0 | 1 |
| Deceleration | 8 | | 5 | 3 |
| Maturation | 11 | 1 | 7 | 3 |
| Completion | 33 | | 25 | 8 |
| **Total** | **53** | **1** | **37** | **15** |

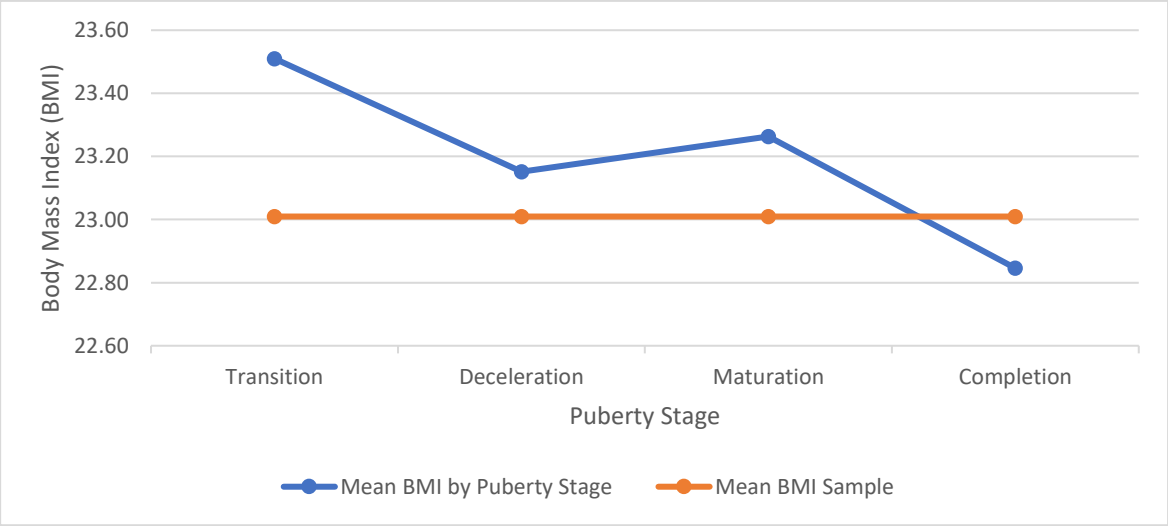



*Figure 56. Body Mass Index (BMI) by puberty stage.*

### *6.3.3.2 Metabolic Disease and Nutritional Stress*

Metabolic and nutritional stress included cribra orbitalia, rickets, scurvy and anaemia. Of the 134 individuals, cribra orbitalia was the most frequent form of metabolic disease or sign of nutritional stress observed and there were no individuals with scurvy or specific anaemia. A single individual, BG354 from Bath Gate, a cemetery site connected to the large Roman city at

Cirencester, showed signs of rickets. BG354, a 13-year-old female in the Acceleration puberty stage, presented with bowing of the left and right tibia (Figure 57) pitting near the auditory meatus and active cribra orbitalia (stage 2 in left orbit; stage 3 in right orbit).

*Figure 57. Bowing in left and right tibia (BG354) indicative of rickets.*

#### 6.3.3.2.1 Cribra Orbitalia

A total of 99 individuals between 10.0 and 24.9 were examined for signs of cribra orbitalia, which represents possible nutritional deficiencies in children. This included 170 individual orbits of which 67 presented with cribra orbitalia that was scored between 2 and 4, resulting in an overall rate of 39.4% (Table 23). Individuals associated with Poundbury Camp had a higher rate of cribra orbitalia (47.1%) with 26 individuals with 51 individual orbits, 24 of which presented with pitting and growths associated with cribra orbitalia. This was the highest rate of any individual site observed.

*Table 23. Rate of Cribra Orbitalia, by age.*

| Age (years) | N | Number of Orbits | Number of Orbits with Cribra Orbitalia | True Prevalence Rate |
|---|---|---|---|---|
| 10 | 3 | 5 | 1 | 20% |
| 11 | 11 | 20 | 11 | 55% |
| 12 | 9 | 18 | 12 | 66.7% |
| 13 | 3 | 5 | 2 | 40% |
| 14 | 7 | 13 | 6 | 46% |
| 15 | 10 | 20 | 5 | 25% |
| 16 | 12 | 20 | 11 | 55% |
| 17 | 3 | 6 | 2 | 33.3% |
| 18.0-19.9 | 11 | 10 | 4 | 40% |
| 20.0-24.9 | 30 | 53 | 13 | 24.5% |

Despite being a disease of early childhood, the prevalence rate of cribra orbitalia is much higher among individuals in the Initiation, Acceleration and Transition stages, before falling steeply among females in the Maturation stage (Table 24). The demands of development during adolescences, particularly leading up to the pubertal growth spurt may be the cause of the high rates among younger women (Balcı, et al., 2012; Soekarjo, et al., 2001; Cairo, et al., 2014).

However, the low rates of cribra orbitalia could also stem from the limited number of orbits in certain age categories and the age range of individuals including within the study.

*Table 24. Rate of Cribra Orbitalia, by puberty stage.*

| Puberty Stage | N | Number of Orbits | Number of Orbits with Cribra Orbitalia | True Prevalence Rate |
|---|---|---|---|---|
| Initiation | 9 | 16 | 11 | 68.8% |
| Acceleration | 16 | 30 | 16 | 53.3% |
| Transition/PHV | 7 | 14 | 8 | 57.1% |
| Deceleration | 11 | 22 | 9 | 40.9% |
| Maturation | 15 | 26 | 4 | 15.4% |
| Completion | 30 | 53 | 14 | 25.9% |
| **Total** | **88** | **161** | **62** | **38.5%** |

## 6.4 Life course Analysis- Childbirth in Roman Britain

A second cohort (n= 402) of females and possible female, aged between 13.0 and 44.9 years from eleven urban and semi-urban Romano-British sites (Table 25) were examined for pelvis typology, a contracted pelvis or pathology associated with pregnancy and childbirth. This group was divided into three developmental stages; Pre-Peak Reproductive (13.0-19.9 years), Peak Reproductive (20.0-34.9 years) and Post-Peak Reproductive (35.0-44.9 years) (Table 26). Divisions within the sample were based on both social and biologically constructed groups. The youngest individuals, 13.0-15.9 years, were selected based on the mean age of first menarche being 14 years. The Peak Reproductive group was created based on modern clincial methods which acknowledge the peak fertility for females to be between 20.0 and 35.0 years of age (Dunson, et al., 2002) and a 1st century Roman law (*Lex Iulia*) stating a woman should be married by the age of twenty or her family would be required to pay a fine every year she remained unmarried. As women approach menopause (Post-Peak Reproductive group) their ability to conceive reduces, thus creating a window of time where women are likely to have survived potentially multiple pregnancies and still become pregnant, however, at a lower frequency than their younger counterparts (Broekmans, et al., 2007; Frank, et al., 1994).

*Table 25. Number of Individuals by Site and Age Category in years.*

| Urban Centre | 13.0-15.9 | 16.0-17.9 | 18.0-19.9 | 20.0-24.9 | 25.0-29.9 | 30.0-34.9 | 35.0-39.9 | 40.0-44.9 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Ancaster** | 1 | 1 | 1 | 5 | 8 | 11 | 3 | 1 | 31 |
| **Ashton** | 0 | 1 | 0 | 2 | 3 | 0 | 2 | 0 | 8 |
| **Baldock** | 2 | 0 | 1 | 1 | 4 | 11 | 2 | 8 | 29 |
| **Bicester** | 0 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 5 |
| **Cirencester** | 1 | 1 | 1 | 2 | 10 | 13 | 3 | 3 | 34 |
| **Colchester** | 4 | 1 | 1 | 3 | 18 | 14 | 14 | 2 | 57 |
| **Dorchester-on-Thames** | 2 | 2 | 1 | 4 | 8 | 4 | 2 | 5 | 28 |
| **Durnovaria** | 11 | 5 | 4 | 14 | 28 | 31 | 18 | 12 | 123 |
| **Gloucester** | 0 | 0 | 0 | 2 | 1 | 2 | 1 | 0 | 6 |
| **Ilchester** | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 1 | 8 |
| **Winchester** | 2 | 6 | 1 | 14 | 23 | 16 | 9 | 2 | 73 |
| **Total** | **23** | **19** | **10** | **50** | **107** | **104** | **55** | **34** | **402** |

*Table 26. Age groups by reproductive period.*

| Reproductive Group | Age Range | Number of Individuals |
|---|---|---|
| **Pre-Peak** | 13-20 years | 52 |
| **Peak** | 20-35 years | 261 |
| **Post-Peak** | 35-45 years | 89 |

### *6.4.1 Stature, Body Mass and Body Mass Index*

Femoral length and stature was determined for 261 females with fused epiphyses (Figure 58). The mean femoral length was 41.5cm with a range of 35.9cm to 47.9cm. The peak within the Gloucester site is due to the small sample size (n=1) and is not indicative of a statistically significant difference in mean femoral length or the resulting mean stature. However, Poundbury Camp, associated with the urban *Civitas Capitals* of Durnovaria has a lower overall mean femoral length at 40.7cm (n=94). The mean stature for the entire sample was 156.6cm with a range of 142.8cm to 172.4cm based on the formula for white females (Trotter & Gleser, 1952).

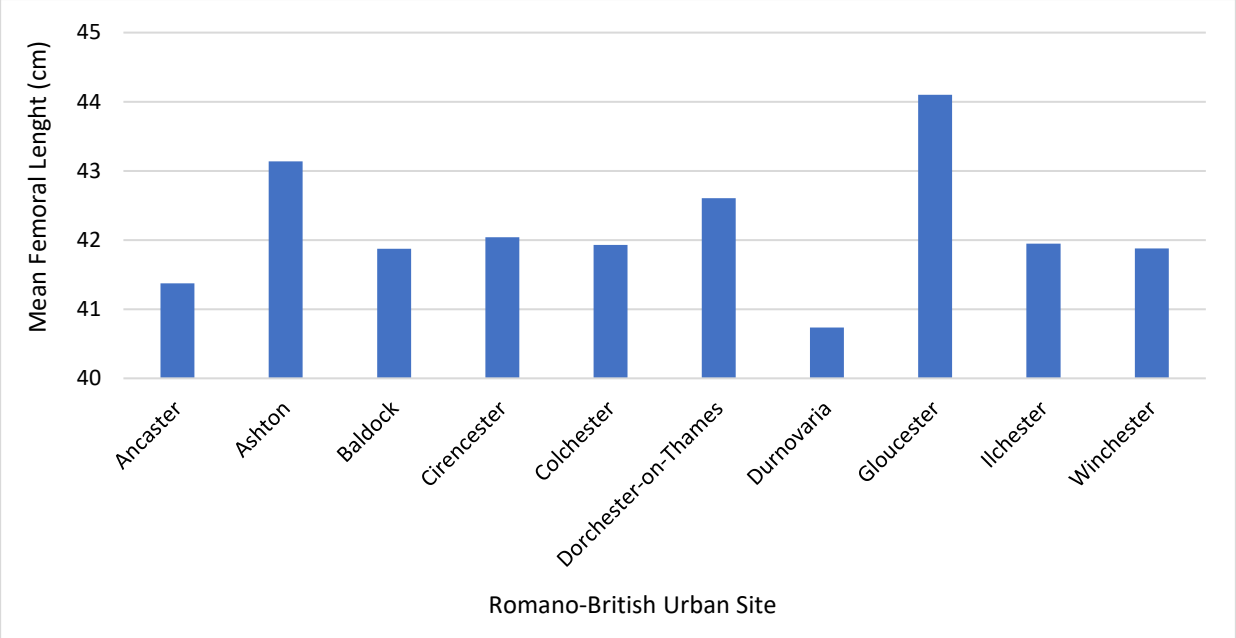



*Figure 58. Femoral Length (cm) by Urban site.*

#### *6.4.1.1 Stature and Obstetrics*

Based on modern clinical studies, 76.2% (n=199/261) of women within the childbirth subsample would be at risk for requiring a caesarean section due to their short stature. This includes 25 women in the 'High Risk' category as 49% of women who are less than 150cm require caesarean sections, 57 in the 'At Risk' category with a stature between 150-154cm and a 47% rate of requiring a caesarean section, and 115 in the 'Low Risk' category with a stature between 155-159cm and an 18% caesarean section rate (Moller & Lindmark, 1997). Although a number of individuals were found to be at risk of obstetric complications due to stature (Figure 59), the relationship between stature and a contracted pelvis was not found to be statistically significant (X2=0.02, 1.d.f.; p=0.15). Additionally, the error rate of determining stature based on femoral length using Trotter and Glesen (1952) of ± 3.72cm makes it difficult to establish obstetric hazards among all but the 'high risk' category. Those in the 'high risk' category, who may range up to 154cm taking into consideration the femoral error range, would still remain at risk for an obstetric hazard as the rate of caesarean sections due to stature remains high through the 154cm group. However, those in the 'At Risk' or 'Low Risk' groups may be at lower risk for obstetric hazards when taking into account the femoral error range. Taking these ranges into consideration, 12 women (49% of the 'High Risk' group) or 5.6% of the total sample would have required a caesarean section or intervention due to stature.

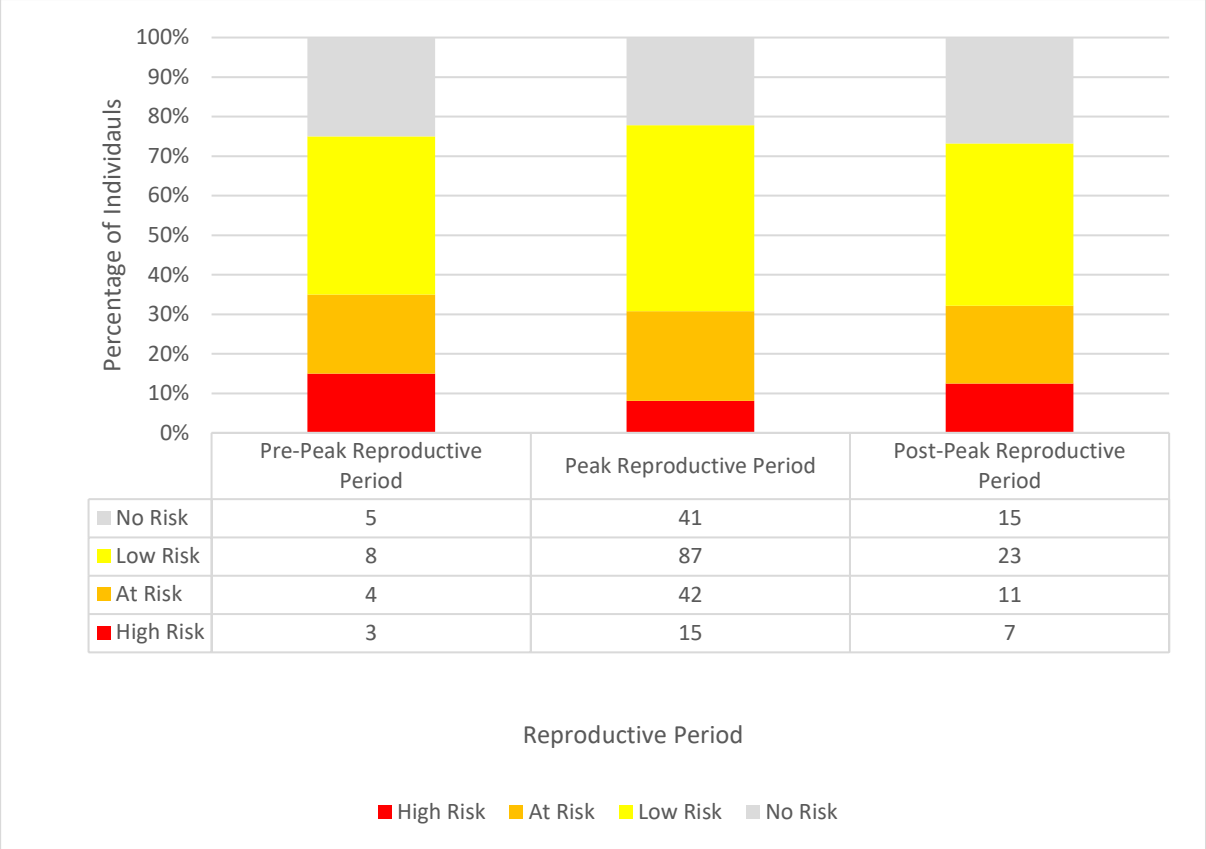



*Figure 59. Percentage of Individuals at Risk of Caesarean Section Due to Stature*

Taken from the three methods, the mean body mass for all age categories was 57.19kg (Table 27). The individuals with the highest body mass were found in the 25.0-29.9 and 30.0-34.9 years but it was the 40.0-44.9 group which had the largest range. As expected, the youngest sample group of 13.0-15.9 years had the smallest body mass. The general trend showed this increased until 20.0-24.9 years when it lowers to 56kg before rising and peaking among the 30.0-34.9years (59.4kg) group. A 35.0-39.9-year-old female from Bath Gate, Cirencester, had the lowest body mass of the sample at 40.23kg. This individual also showed signs of pathology including evidence of healed rib fracture, spina bifida, scoliosis and an asymmetrical pelvis. A female from Poundbury Camp between 40.0-44.9 years had the highest body mass (74.9kg). This individual also displayed changes associated with ageing and a larger body size including such as thoracic and lumbar osteophyte growths, collapsing of the cervical vertebra and a prematurely fused coccyx.

*Table 27. Mean body mass, by age.*

| Age Category | N | Mean (Kg) | Range |
|---|---|---|---|
| 13.0-15.9 | 6 | 54.8 | 49-61 |
| 16.0-17.9 | 10 | 56.6 | 45-67 |
| 18.0-19.9 | 7 | 58.2 | 54-62 |
| 20.0-24.9 | 38 | 56.0 | 46-67 |
| 25.0-29.9 | 80 | 57.9 | 48-71 |
| 30.0-34.9 | 77 | 59.4 | 51-71 |
| 35.0-39.9 | 34 | 58.2 | 40-68 |
| 40.0-44.9 | 23 | 59.1 | 44-75 |
| **Total** | **274** | **57.5** | - |

When examined by reproductive group the trend is clear with the Pre-Peak Reproductive group having a mean of 56.5kg, the Peak Reproductive group at 57.7kg and the Post-Peak group at 58.7kg (Figure 60).

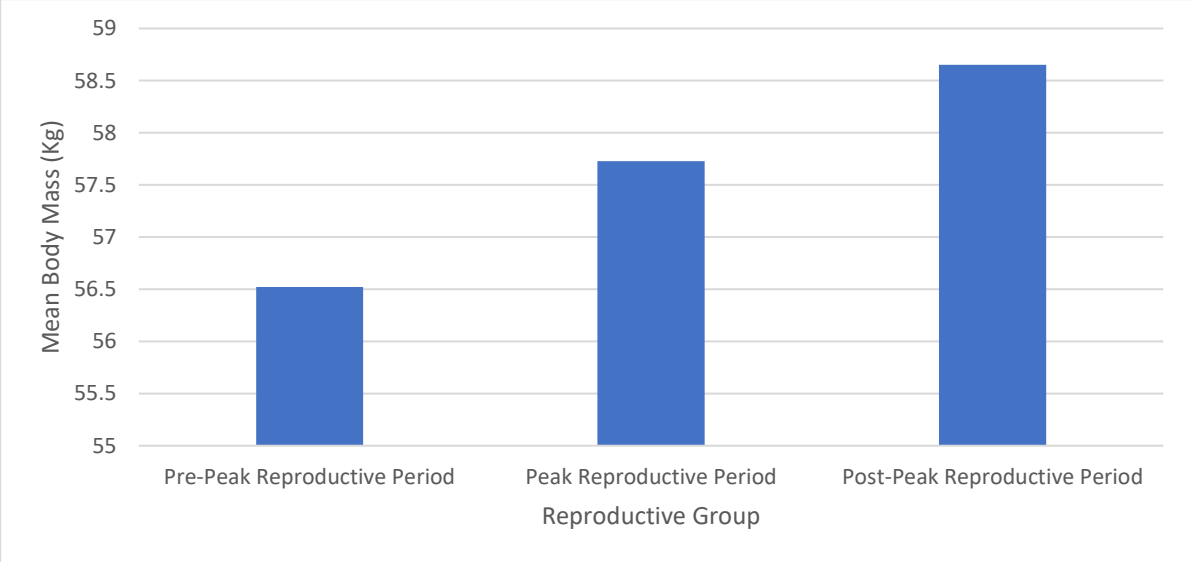



*Figure 60. Mean body mass by reproductive group.*

### *6.4.2 Body Mass Index*

Body Mass Index (BMI) was determined for 255 females 18.0-29.9 years with a similar mean across the age groups, ranging from 22.6-23.7 (Table 28). No individuals were determined to be underweight based on a combination of age and height. However, two individuals would be considered 'borderline' as they had BMI's of just under 20 and were over 160cm. At the same time, none of the females from the Romano-British sample had a BMI over 29 and even though they are often short in stature this places them within the overweight but not obese category. No individuals were found to be at risk of obstetric complications due to a BMI over 30 (Modder & Fitzsimons, 2010).

*Table 28. Body Mass Index (BMI) by age category.*

| Age Category | N | Mean | Range |
|---|---|---|---|
| 13.0-15.9 | 5 | 23.7 | 21-27 |
| 16.0-17.9 | 10 | 22.6 | 20-25 |
| 18.0-19.9 | 4 | 23.6 | 21-25 |
| 20.0-24.9 | 34 | 23.1 | 19-27 |
| 25.0-29.9 | 75 | 23.3 | 20-28 |
| 30.0-34.9 | 75 | 23.6 | 20-27 |
| 35.0-39.9 | 30 | 23.7 | 21-28 |
| 40.0-44.9 | 22 | 23.1 | 20-26 |
| **Total** | **255** | **23.4** | **19-28** |

### *6.4.3 Pelvic Development*

Each pelvis was assigned to one of four typologies: Gynaecoid, Platypelloid, Android and Anthropoid. The expected rates for each typology based on modern populations are Gynaecoid between 50% and 70%, for Anthropoid and Android between 10%-20%, and the least common Platypelloid at 5%. Based upon visual assessment, the most common pelvis typology was Gynaecoid (43.5%; n=175), followed by Platypelloid (22.6%; n=91), Android (16.6%; n=67) and Anthropoid (9.7%; n=39). The Gynaecoid and Anthropoid are both lower than the expected range, however, the Anthropoid is only 0.3% outside of the range. The Platypelloid type is above the expected range and associated with potential obstetric complications due to extra rotations necessary during labour (Cunningham, et al., 2010).

#### *6.4.3.1 Pelvic Typology*

When divided into reproductive stages (Figure 61), the Gynaecoid type remains the most common throughout the life course; however, it falls from 50% to below expected rates at 39% between the Peak and Post-Peak Reproductive groups. Both the Anthropoid and Platypelloid become more common across the life course. The Anthropoid type falls outside of this range only in the Pre-Reproductive Period (5%). The Platypelloid type, associated with potential obstetric hazards, is consistently higher than expected ranging from 17%-27%. The Android type begins at 31% in the Pre-Reproductive Period before falling to 15% in the Peak Reproductive Period and rising again to 20% in the Post-Peak Reproductive Period which is within than the expected range of 10%-20%. When examined by age category, the 16.0-17.9 (n=18) had the lowest rate of Gynaecoid pelvis types (33.33%; n=6). However, only three age categories 13.0-15.9 (62.5%), 18.0-19.9 (50.0%), and 25.0-29.9 (54.7%) were within the expected range for Gynaecoid pelvis type. While the Android shape peaks within the 18.0-19.9 (37.5%; n= 3) group, the frequency falls outside the expected range in all age groups aside from the 20.0-24.9 (16.3%; n=7), 25.0-29.9 (7.6%; n=8), and 35.0-39.9 (18.0%; n=9). Although the

Anthropoid pelvis is commonly found in other mammals, in humans the expected range is 10%-20% and within the study, no age groups exceeded this range. The Platypelloid shape is the most dangerous to childbirth and has the lowest frequency among modern females at 5% (Cunningham, et al., 2010); however, this was exceeded in every age group (Figure 62).

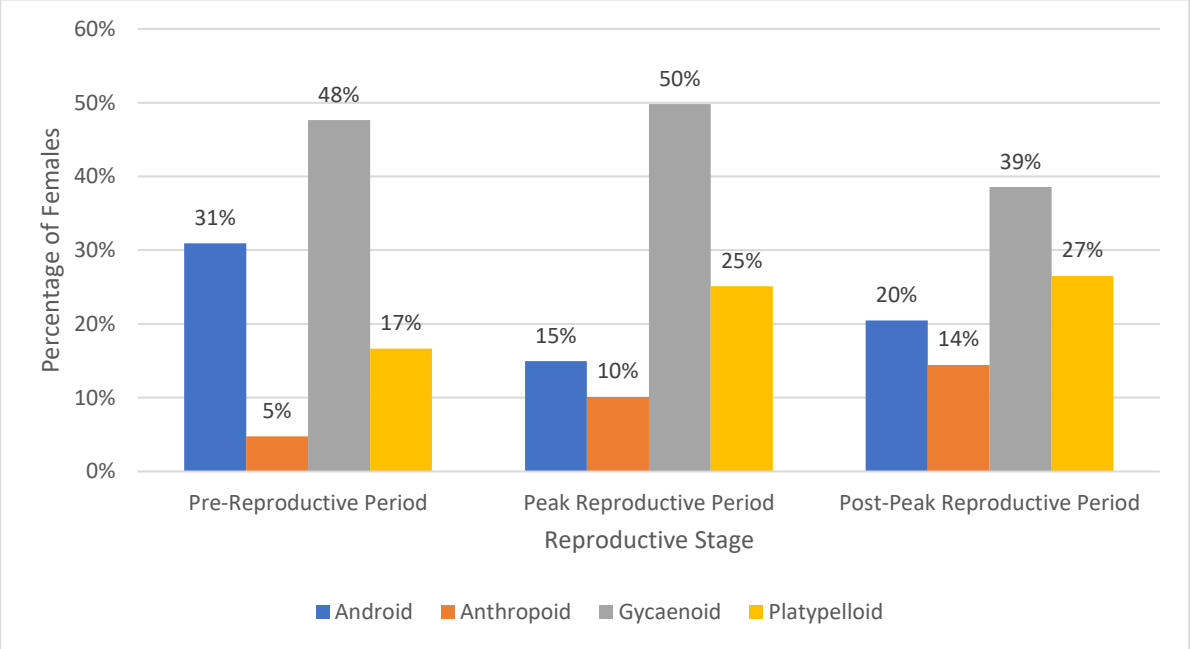



*Figure 61. Percentage of pelvis typology by reproductive period.*

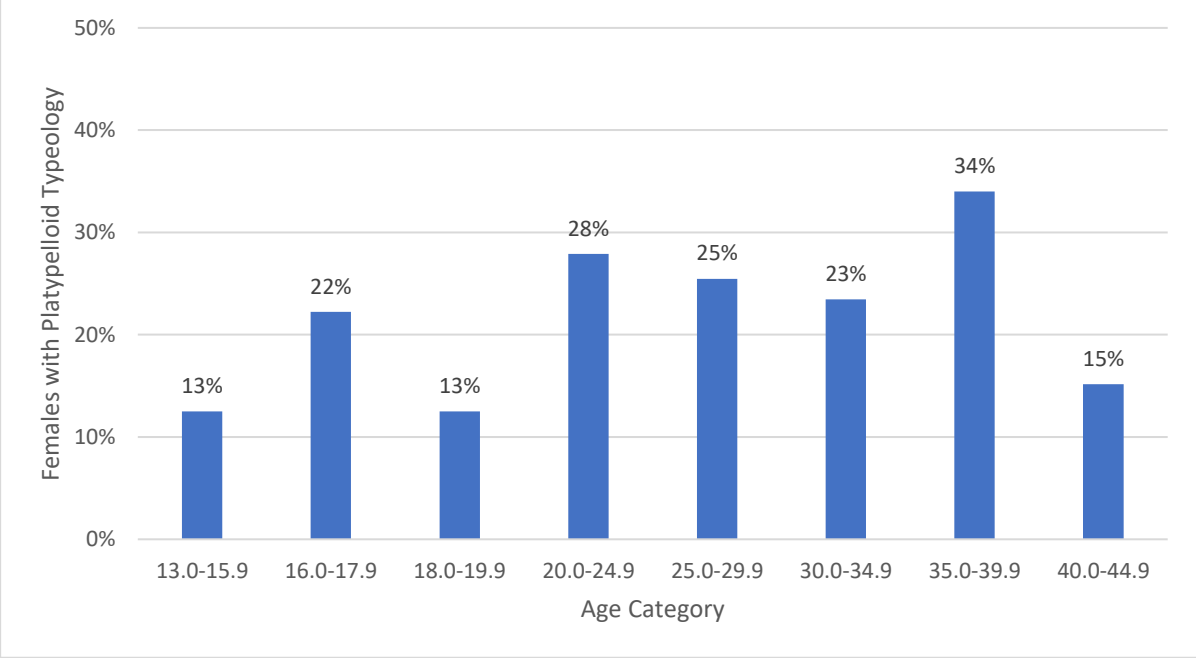



*Figure 62. Percentage of females presenting with platypelloid pelvis type, by age.*

### *6.4.3.2 Pelvic Contraction*

A pelvis is considered obstetrically contracted when one or more of the diameters is reduced sufficiently to interfere with the normal mechanisms of labour. This can occur during

development or as the result of various pathologies (Cunningham, et al., 2010). Three dimensions were observed on 402 female pelvises: the inlet, midplane, and outlet. All three dimensions consist of a transverse and anterior-posterior also referred to as the conjugate measurement, along with the angle of the pubic arch, creating a possible seven total measurements for each pelvis (Bull, 1949; El-Mowafi, 2017).

#### *6.4.3.3 Pelvic Inlet*

For the transverse (n=252), 17.5% (n=44/252) were considered contracted by modern measurements and 7.5% (n=19/252) using Bull's measurements. When divided by reproductive period the highest level was found in the Pre-Reproductive Period (71.9%; n=32/252), followed by the Peak-Reproductive period (20.9%; n= 163/252) and finally the Post-Reproductive Period (12.1%; n=58/252). Pelvis typology can also play a role in contraction and among contracted pelvises the Gynaecoid shape represented 46% (n=29/252) of the contracted sample and 16.6% of the total Gynaecoid sample (n=175/252). This was followed by Platypelloid at 23.8% (n=15/252) of the contracted sample and 16.5% of the total Platypelloid typology sample (n=91). However, neither the Gynaecoid type (X2=1.34, 1.d.f.; p=3) nor the Platypelloid type (X2=1.22, 1.d.f.; p=2.37) were found to be statistically significant.

When methods are compared, the rates for contraction are much lower based measurements presented by Bull (1949) at 19 (7.5%) individuals. Similar to clinical methods, the Pre-Reproductive group had the highest rate of contraction at 28.1% (n=9), followed by the Post-Reproductive group at 6.9% (n=4) and the Peak-Reproductive group at 0.6% (n=1). Within the contracted pelvis sample, the Gynaecoid type represented 55.6% (n=5) of the sample and 2.9% of all Gynaecoid pelvis types (n=175) were contracted. Within the Platypelloid typology, four individuals were contracted, representing 2.2% of the contracted sample and 4.4% of the total sample (n=91).

However, within the complete sample (n=402) no individuals presented with a pelvic inlet under 7.5cm which in modern patients requires medical intervention during childbirth in 85% of cases. One female aged 13.0-15.9 years presented with a pelvic inlet under 8cm which today has a 75% intervention rate (Leavitt, 1913) and would qualify for a level 3- severe contraction resulting in an automatic caesarean section (El-Mowafi, 2017). Additionally, 6 individuals presented with a transverse measurement between 8cm and 9cm or a level 2- moderate contraction which has a 50% intervention rate. All individuals in this group, aside from a single 20.0-24.9-year-old female, were in the 13.0-15.9-year age category.

For the anterior-posterior or conjugate inlet measurement (n=121), 19% (n=23/121) were considered contracted by modern measurements and 8.7% (n=10/121) using Bull's measurements. Among both sets of measurements, the highest percentage of contracted pelvises was found within the 16.0-17.9 age group (66.7%; n=3), followed by the 13.0-15.9 age group (50%; n=2). The lowest rates of contraction using the modern method was found in the 35.0-39.9 group (7.1%; n=4); although, when using Bull's measurements, it was within the 20.0-24.9 group (6.25%; n=1). When examined by pelvis type, only the Android and Platypelloid shapes were contracted. Within the sample, there were no Gynaecoid or Anthropoid pelvises below the threshold for a vaginal birth by either method. When divided into reproductive groups, the highest rate of contraction was found in the Pre-Reproductive group with Android pelvis types (57.1%; n=4); however, among the Peak-Reproductive group, it was the Platypelloid shape which was frequently the most contracted (8.9%; n=4).

For the brim area (n=118) only Bull's (1949) method was used. Based on past population measurements, four individuals had contracted pelvises, two within the 13.0-15.9 age group, and one in each of the 16.0-17.9 and 20.0-24.9 groups. Using the modern measurements, 15 individuals fell below the threshold. The largest number of contracted measurements were within the 13.0-15.9 age group (n=4), followed by the 20.0-24.9 (n=3) and 25.0-29.9 (n=3) groups, then 16.0-17.9 (n=2) and a single individual within the 30.0-34.9, 35.0-39.9, 40.0-44.9 groups. There were no individuals within the 18.0-19.9 age group with a contracted brim area measurement based on either set of criteria.

#### *6.4.3.4 Pelvic Midplane*

For the transverse (n=96), 8.3% (n=8) between 18.0-39.9 years were considered contracted by modern measurements and 1% (n=1) aged 18.0-19.9 years using Bull (1949). The pelvis types which presented with transverse contracted measurements were Gynaecoid (n=4), Android (n=3), and Platypelloid (n=2). Bull (1949), states 9.5cm as the threshold for a contracted anterior-posterior measurement and two individuals, aged 16.0-17.9 and 20.0-24.9 fell below this measurement. The threshold among modern populations is 11.5cm. Using this higher threshold, 15 individuals had contracted measurements ( Figure 63). Unlike previous measurements, the 40.0-44.9 group saw a higher rate of contraction (50%; n=8) which increased the rate among the Post-Peak Reproductive group. There was evidence of contracted pelvises in each pelvic typology, however, only a single individual aged 35.0-39.9 had an Anthropoid pelvis type. This is the single example of a contracted Anthropoid midplane measurement. Additionally, no individuals had a contracted midplane area using either set of measurements.

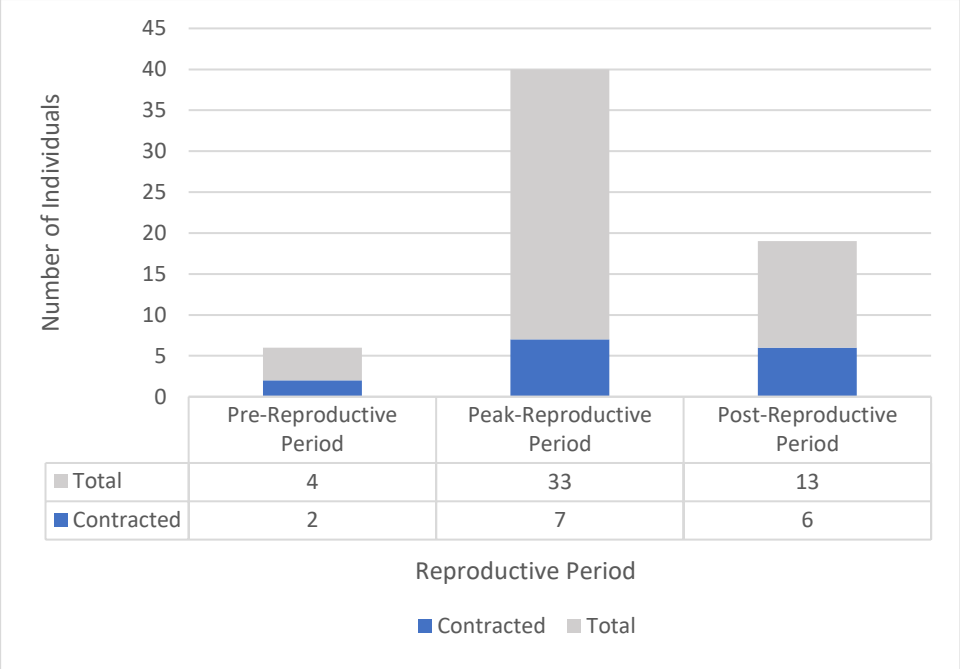



*Figure 63. Rate of Contracted pelvic midplane measurements using the modern threshold of 11.5cm.*

#### *6.4.3.5 Pelvic Outlet*

Due to preservation levels, the transverse of 10 females aged 18.0-44.9 was taken. Two individuals, aged 18.0-19.9 with an Android pelvis shape and a 20.0-24.9 individual with a Gynaecoid pelvis shape, were considered to have contracted outlets based on Bull (1949). However, no individuals were considered contracted based on modern measurements.

#### *6.4.3.6 Pubic Arch Angle*

The pubic arch angle ranged from 70° to 140° with a mean of 107.7° (n=101). According to Bull (1949) a single individual aged 13.0-15.9 with an angle of 70°, who had reached the completion stage, would have been unable to vaginally deliver a viable fetus. Based on modern measurements (Gilboa, et al., 2013) the same individual would show a 93% chance of requiring a Caesarean section. Additionally, seven individuals ranging in age from 13.0-44.9 years would likely fail to undergo spontaneous delivery as their pubic arch angle was <90°. The rate of individuals within the 40.0-44.9 age group below this was 20% (n=15) compared to 3% (n=33) for the 30.0-34.9 age group. When examined by reproductive period, the mean rose between the Pre-Reproductive group from 98.6° (n=10) to 111° (n=63) among the Peak-Reproductive group before falling to 107.5° (n=27). The percentage of individuals below the 90° threshold suggested by Gilboa (2013) was highest among the Pre-Reproductive group at 20% (n=2), and the lowest among the Peak-Reproductive group at 3% (n=2) and then rose to 11% (n=3) among the Post-Peak Reproductive group.

The angle of the pubic arch can be influenced by pelvis typology. Within the sample (n=99) the mean ranged from 100.7° to 111.0° with the Anthropoid having the lowest and the Platypelloid having the highest (Table 29). This, however, is not reflected in the rate of contraction as the highest rate was found among the Gynaecoid group (11.4%; n=4) and the lowest in the Platypelloid group (0%; n=0).

*Table 29. Rate of Pubic Arch Angle Contraction*

| Pelvis Typology | N | Contracted | Rate of Contraction | Mean | Minimum | Maximum |
|---|---|---|---|---|---|---|
| **Android** | 34 | 2 | 5.9% | 102.6° | 80° | 128° |
| **Anthropoid** | 11 | 1 | 9.0% | 100.7° | 80° | 118° |
| **Gynaecoid** | 35 | 4 | 11.4% | 105.8° | 70° | 128° |
| **Platypelloid** | 18 | 0 | 0% | 111.0° | 91° | 129° |
| **Total** | **98** | **7** | **7.1%** | **107.5°** | **70°** | **129°** |

### *6.4.3.7 Pelvis Typology and Contraction*

When the sample was divided into the four main pelvis typologies; Android, Anthropoid, Gynaecoid, and Platypelloid (Figure 64), the highest proportions of females with contracted pelvises fell into the Android typology when relying on modern measurements (n=24/50). Using measurements provided by Bull (1949) the lowest rates of contraction were found within the Anthropoid group (n=0/25), followed by the Android group (n=9/41).

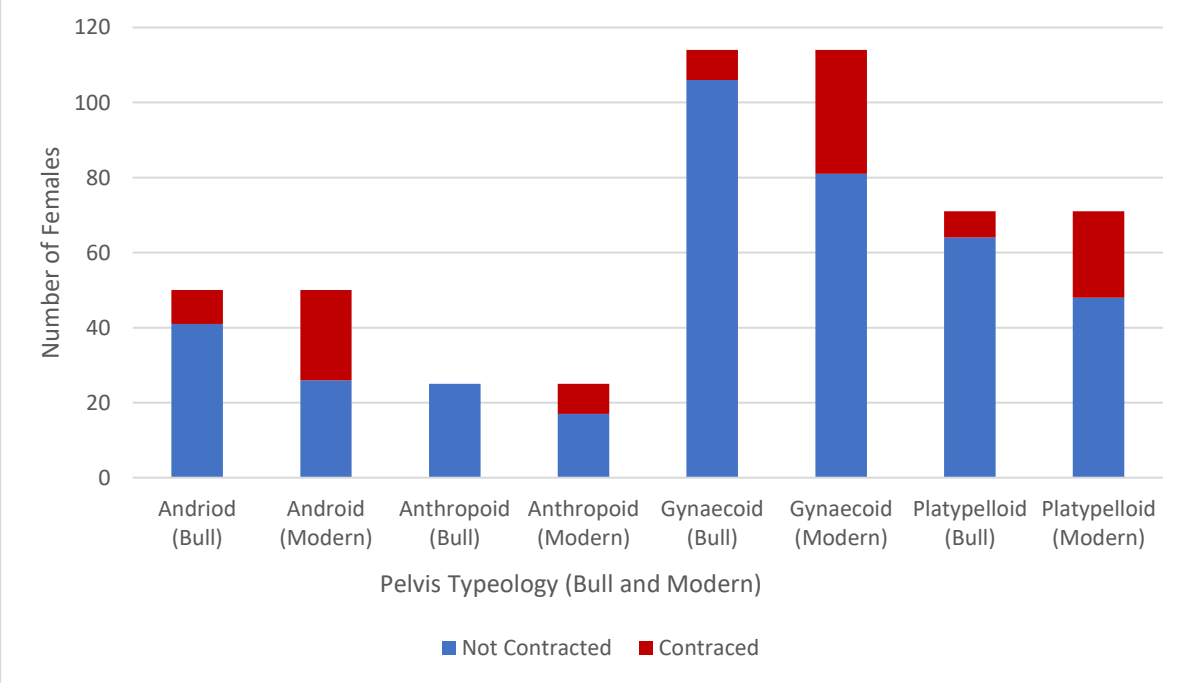



*Figure 64. Number of individuals with a contracted by pelvis type.*

#### 6.4.3.8 *General Pelvis Contraction*

Within the sample, 34% (n=89) had at least one pelvic measurement considered to be contracted, 9.6% (n=25) fell into the 'high risk' category, based on Bull (1949) while 24% (n=63) were 'at risk' based on modern clinical methods (Figure 65). The difference between the two methods stems from Bull (1949) being based on minimal viable fetus size, hence high risk, while the modern methods are based on caesarean section protocols as they are at risk without intervention.

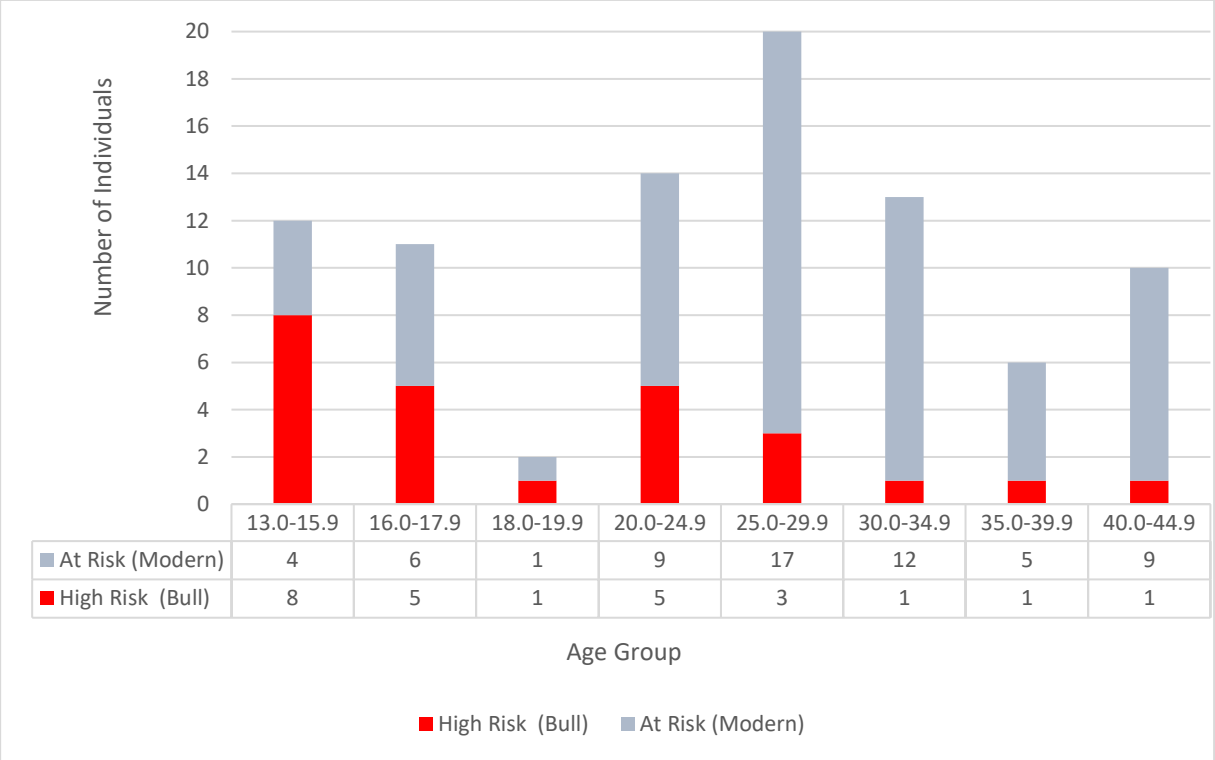



*Figure 65. Comparison of two pelvic contraction methods.*

Only one individual, a 13.0-15.9-year-old was determined to be contracted by Bull (1949) and not by clinical measurements. However, this is due the lack of a pelvic brim area threshold within the clinical recommendations. Therefore, both methods were combined when discussing the need for medical intervention based on modern clinical practices (Figure 66). The rate of contraction is 100% for individuals between 13.0 and 15.9 (n=13). The rate of contraction continues to reduce until the 18.0-19.9 age category when it rises from 33.3% among the 18.0-19.9 group to 51.7% of the 20.0-24.9 group. The rate then continues to fall, reaching a low among the 35.0-39.9 group (17.1%) and raises again to 41.7% within the 40.0-44.9 group.

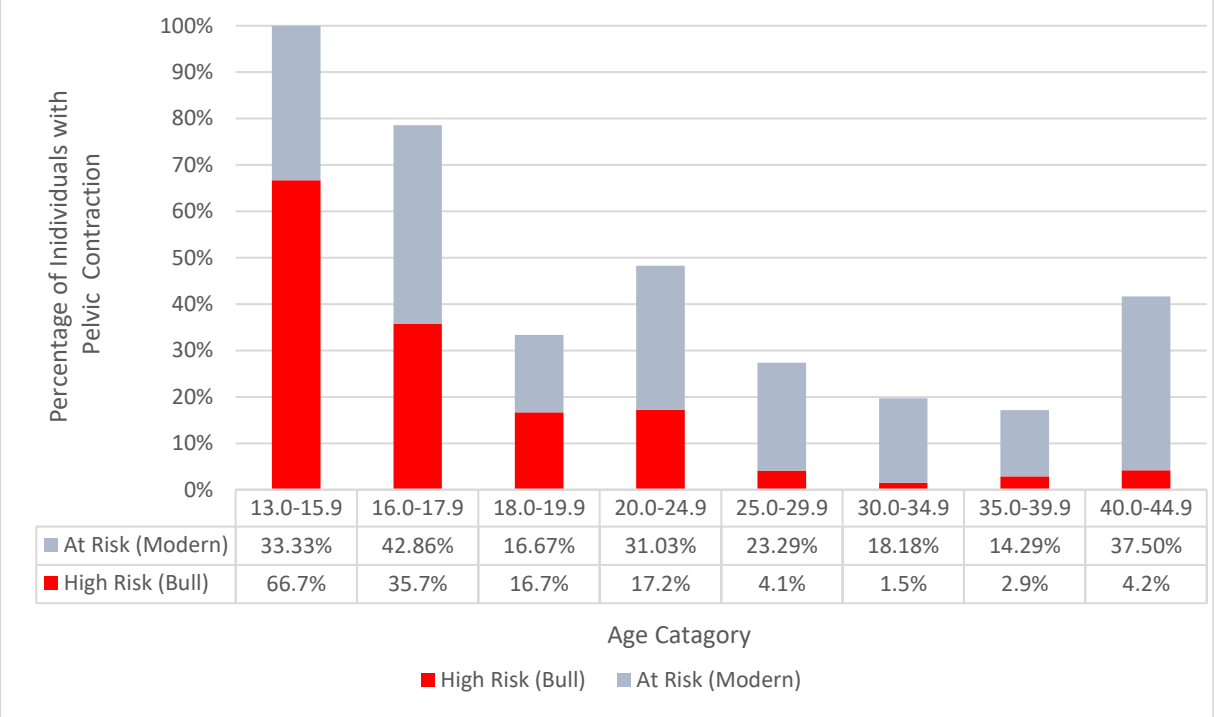



*Figure 66. Rate of contraction by age group.*

When examined by reproductive period the peaks within the small age groups are much lower (Figure 67). The Pre-Peak Reproductive period remains high at 78.8%. The previous peaks in the 20.0-24.9 and 40.0-44.9 groups result in the Peak Reproductive period and the Post-Reproductive group having a nearly identical rate of contraction at 28% and 27% respectively.

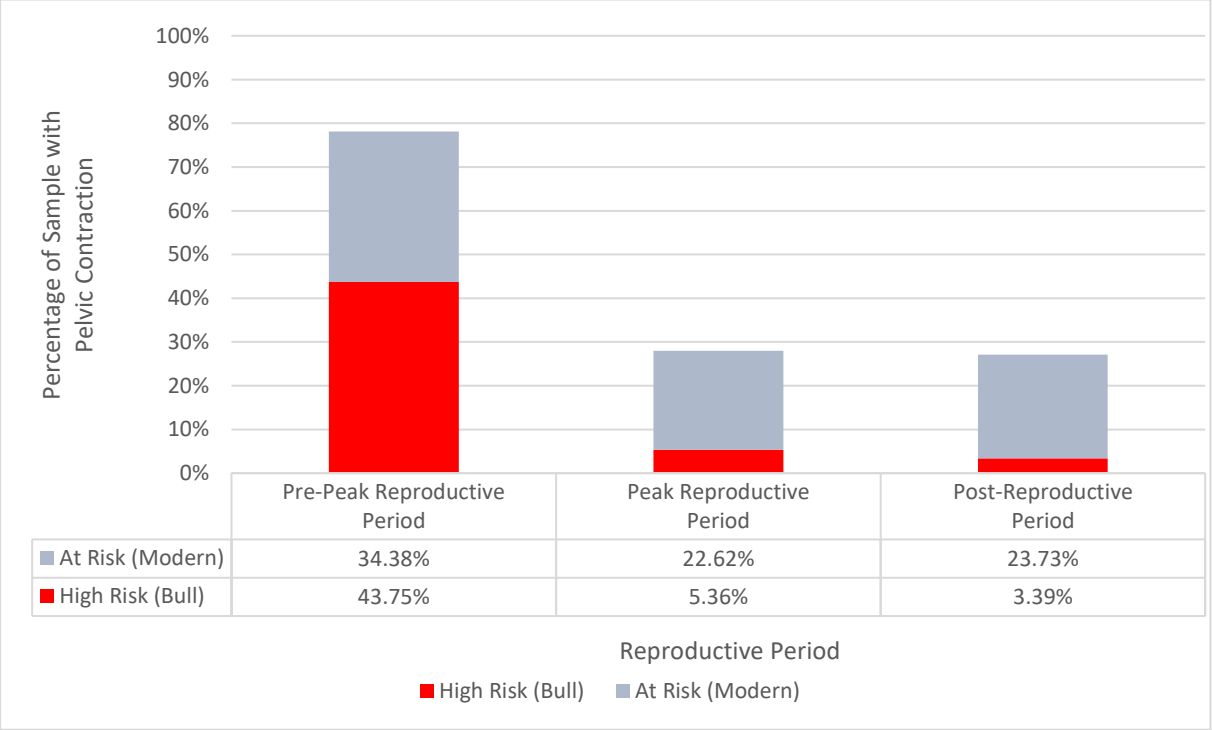



*Figure 67. Rate of contraction by reproductive period.*

#### 6.4.3.8.1 Multiple points of Contraction

The risk of an obstetric hazard increases as more points are contracted, particularly when moving from one to two points. While one contracted measurement is the most common (n=38/47; 80.1%), 13.3% (n=13) had two contracted measurements and one, a 20.0-24.9-year-old with a Platypelloid pelvis type, had three points of contraction. When examined by reproductive group, there is a reduction with age until the Post-Peak Reproductive group in which one pelvis has two points of contraction (Figure 68).

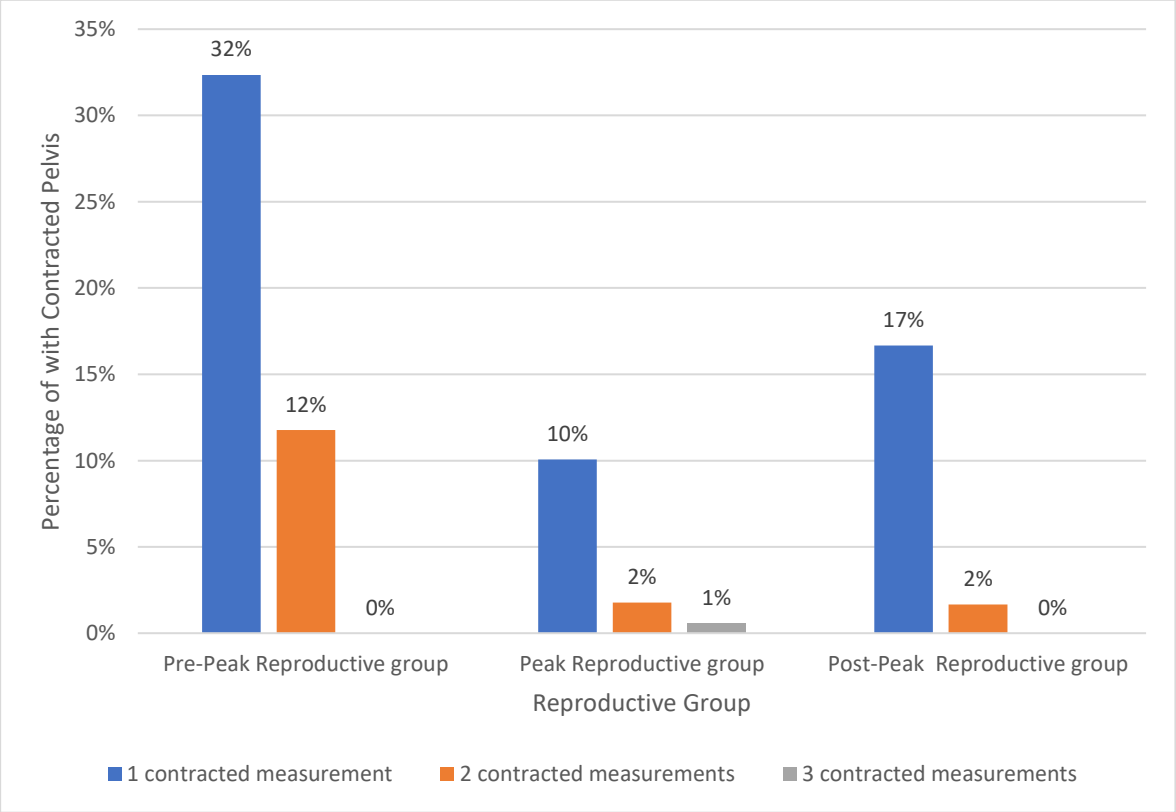



*Figure 68. Number of contracted measurements by reproductive group using Bull (1949) and Cunningham et al. (2010).*

### *6.4.4 Obstetric Pathology*

Within the study, pathology associated was divided into three main categories: Developmental or Congenital, Metabolic Diseases, and Joint Diseases which can influence the potential outcome of a pregnancy and childbirth. Within the sample, no individuals presented with metabolic diseases which would have influenced the shape of the pelvis and resulted in an obstetric dilemma. However, joint disease was present in 32.1% (n=129) of individuals while 16.7% (n=67) presented with a developmental or congenital disease.

When examined by reproductive period (Figure 69), joint disease increases with age while development or congenital diseases peaks within the Peak-Reproductive period group (21%;

n=55). Rates of developmental pathology were found to be statistically significant (X2=1.66, 1.d.f.; p=7.91) between the Peak Reproductive group and the Post-Peak Reproductive group; however, the rates between the Pre-Peak Reproductive group and the Peak Reproductive were not found to be statistically significant (X2=049, 1.d.f.; p=3.67).

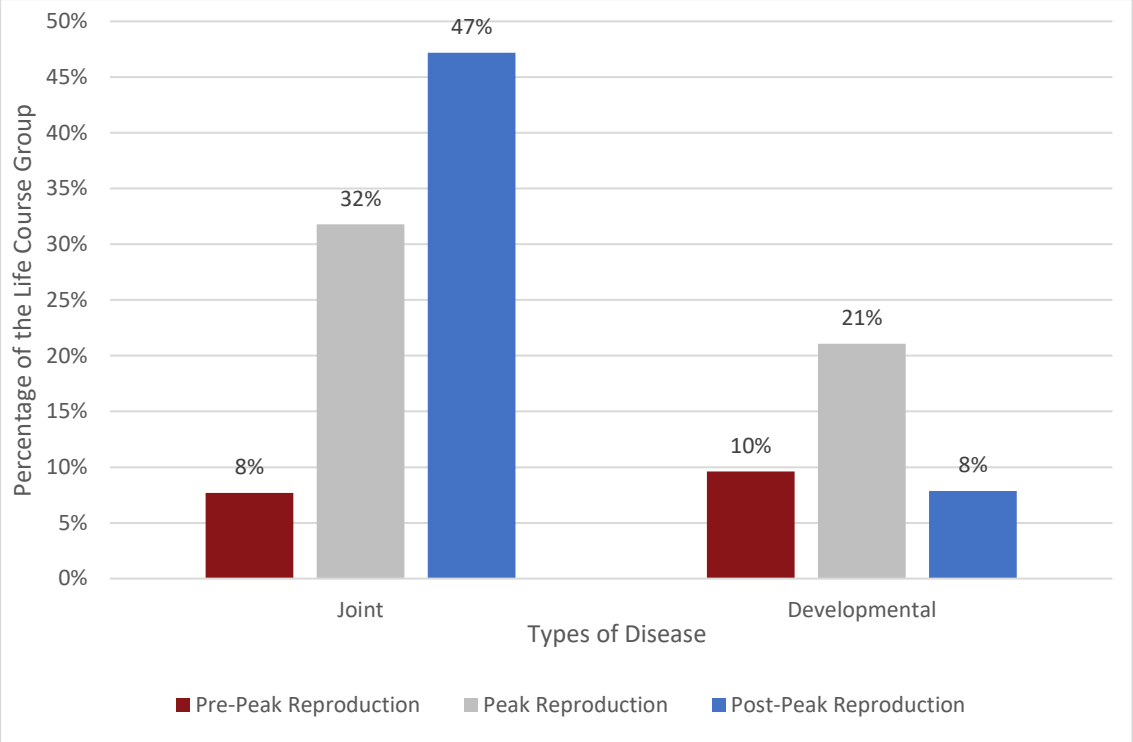



*Figure 69. Frequency of diseases based on reproductive period.*

#### *6.4.4.1 Joint Disease*

Within the recorded joint diseases (Figure 70) osteophytes of the lumbar followed by the thoracic vertebrae were the most common, particularly among the Post-Reproductive period group. Sacro-iliac osteophytes are particularly hazardous during birth and can be caused by instability during pregnancy. The loss of the 1-2cm gained from the stretching of ligaments can result in an obstructed pregnancy and death for both mother and neonate (Cunningham, et al., 2010; Dewhurst, 1953; Leavitt, 1913; Tague, 2009). Within the Pre-Reproductive 1.9% (n=10) had sacro-iliac osteophytes; however, they were only found within the 18.0-19.9 age group. Schmorl's Nodes, were unique in that they were the only joint disease present in all three reproductive stages, peaked among the Peak-Reproductive group and were the lowest among the Post-Peak Reproduction group. Additionally, the production of relaxin can increase the risk of developing secondary osteoarthritis which can be further exasperated by inflammation and displacement after pregnancy, again influencing the next.

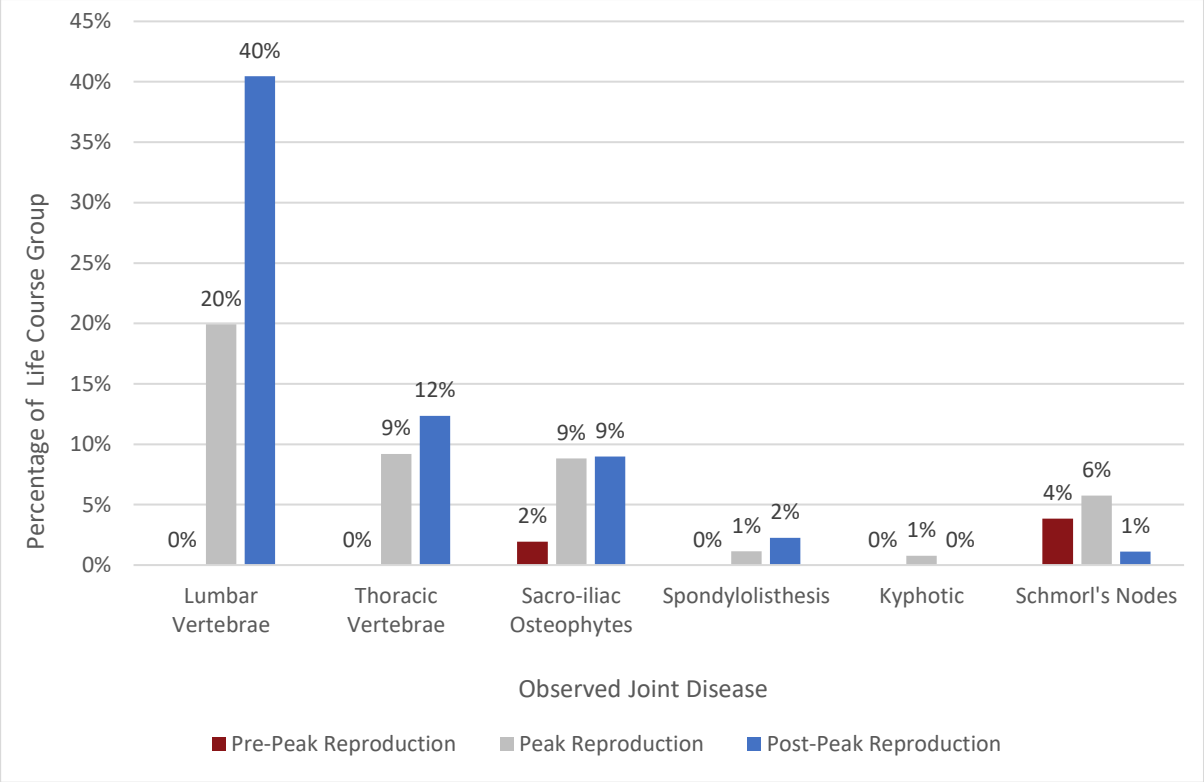



*Figure 70. Percentage of observed joint disease by reproduction period.*

Lumbar osteophyte formation was present in 60 individuals with a prevalence rate of 21.2%. No individuals were affected in the Pre-Peak Reproductive group; however, two individuals (0.6%) within the 20.0-24.9 age group showed low stages of osteophyte formation (Figure 73). Within the Peak Reproductive group the prevalence rate was 17.1% (n= 32/187); however, this rose to 40% (n= 28/70) in the Post-Peak Reproductive group due to 62.0% of individuals aged 40.0-44.9 presenting with lumbar osteophyte growths. Thoracic osteophytes were present in 54 resulting in a prevalence rate of 17.8%; however, the youngest individual to present with thoracic osteophytes was 20.0-24.9 (0.03%; n=1). Among the Peak Reproductive group 32 individuals (15.4%) while 22 (28.9%) in the Post-Reproductive group had osteophyte growths primarily due to the high rates among the 40.0-44.9 age group (54.8%; n=17). A notable case is individual LH168, a 30.0-34.9-year-old female from Lankhills who had osteophyte growths on several vertebrae, particularly among the thoracic vertebra (Figure 71).

Sacro-iliac osteophyte formation has the greatest potential impact on vaginal birth depending on the severity. Within the Pre-Peak Reproductive group sacro-iliac osteophytes were observed in 10 individuals and only within the 18.0-19.9 age group. Rates within the Peak Reproductive and Post-Peak Reproductive groups were similar at 8.8% (n=23) and 8.9% (n=8) respectively. Sacro-iliac osteophytes are particularly hazardous when the osteophytes hinder the ability of ligaments to stretch during childbirth. An excellent example is BR167, a 35.0-39.9-year-old female from

Butt Road in Colchester, who has an osteophytes which would prevent the anterior sacro-iliac ligament from stretching (Figure 74). Additional osteophyte growths could also influence the anterior longitudinal ligament which runs along the anterior surface of the lumbar vertebra, sacrum to the coccyx.

*Figure 71. Osteophytes (LH168).*

*Figure 72. Stage 1 osteophytes (LS23)*

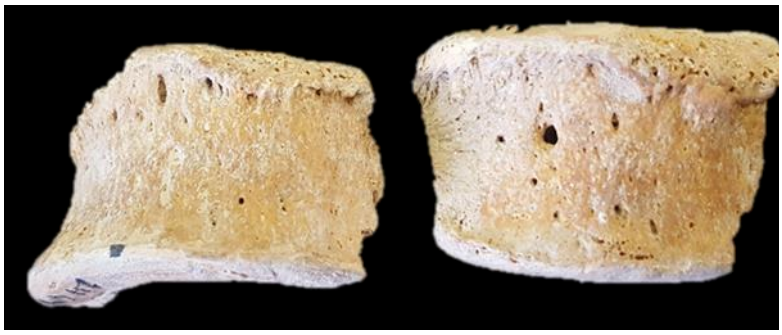


*Figure 73. Stage 1 osteophytes (LH119)*

*Figure 74. Sacro-iliac osteophytes (BR167).*

#### 6.4.4.2 *Developmental and Congenital Pathology*

A wide range of skeletal changes due to various developmental and congenital pathologies were noted (Figure 75). Lumbarization, pubic symphysis changes and hip dysplasia were only found in the Peak Reproductive group. Malformed sacral alae had the highest prevalence in the Pre-Peak Reproductive group (12%; n=3/25), lower in the Peak Reproductive Group (3.4%; n=5/148) but non-existent in the Post-Peak group. The difference between the malformed sacral alae in the Pre-Peak Reproductive group verses the rest of the sample proved to be statistically significant (X2=4.36, 1.d.f.; p=5.13). An 18.0-19.9-year-old individual (KH131) from Kingsholm Drive in Bradford presented with a malformed sacral ala due to a twisted transitional vertebra (Figure 77). Extreme sacral curvature was higher among the lower age groups (8%; n=2/25) in the Pre-Peak group and 6.8% (n=10/148). Similarly, sacralization is the highest among the Peak-Reproductive Group (7.2%; n=9/148) but was not found among the Post-Peak group. Overall, the trend indicates that specific pathologies such as a malformed sacral ala or extreme sacral curve affected younger individuals at a higher rate while a prematurely fused coccyx, spina bifida occulta, and an assimilated pelvis were found at a higher rate among women who were approaching the end of their reproductive period.

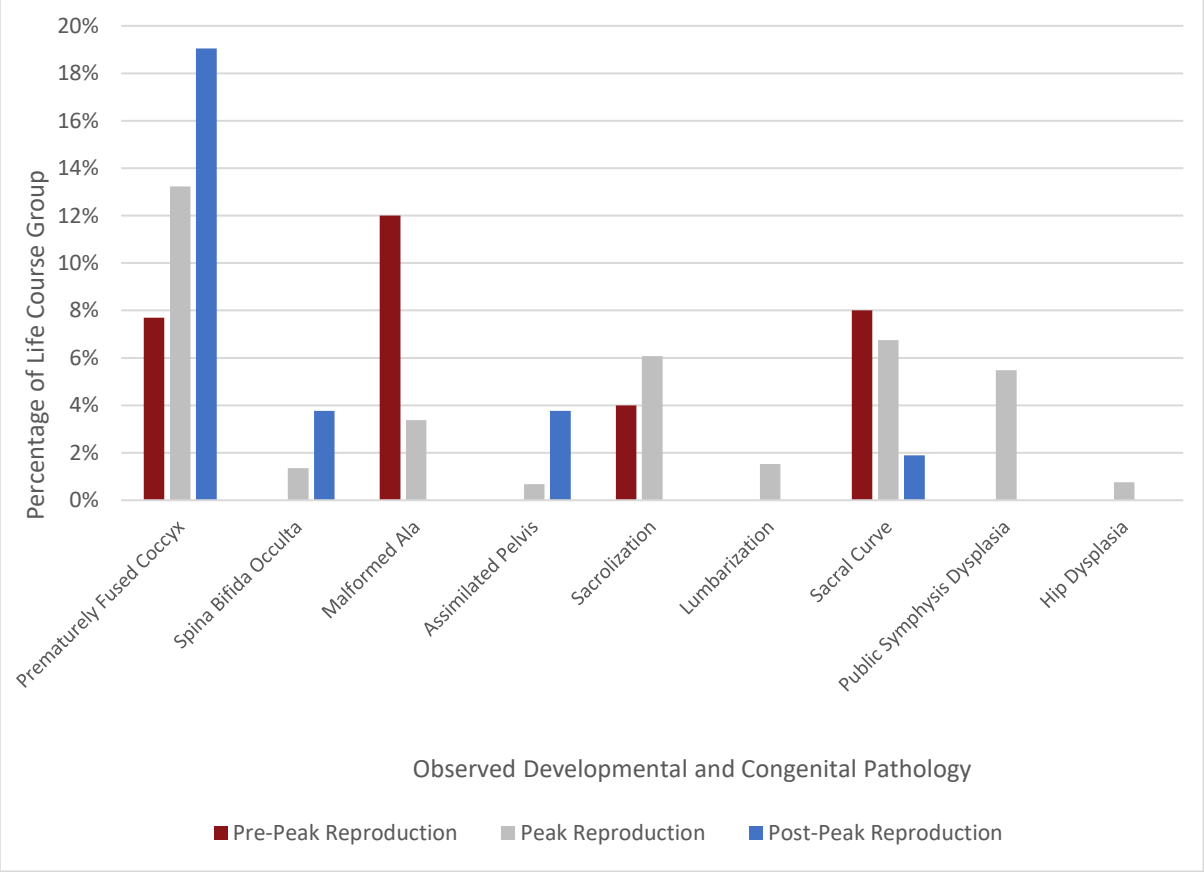



*Figure 75. Percentage of observed development and congenital pathology by reproduction period.*

A total of 32 individuals, primarily in the Post-Peak Reproductive group (7.7%; n= 3/13) presented with a prematurely fused coccyx including PC611 (Figure 76), a 25.0-29.9-year-old female from Poundbury Camp, who would have limited the flexibility of the coccyx during childbirth. Spina bifida occulta was not present in any individuals within the Pre-Peak Reproductive group but was present in both the Peak Reproductive (n=2/148) and Post-Peak Reproductive (n=2/53) groups. Only individuals within the 16.0-17.9 and 18.0-19.9 age groups had malformed sacral ala (Figure 77). Within the Peak-Reproductive group the prevalence rate was 3.3% (n=5) but was not present in individuals over the age of 30.0-34.9 (n=1). Both lumbarization (n=4/148) (Figure 78) and sacralisation (n=10/148) (Figure 79) and have the highest prevalence rates in the Peak Reproductive group and no individuals in the Post-Peak Reproductive group. Although it affects the same ligaments and muscle groups, no individuals within the Pre-Peak Reproductive group presented with an assimilated pelvis (Figure 80, Figure 81), which peaked among the Post-Peak Reproductive group (n= 2/53). Sacral curvature ( Figure 82), which reduces the midplane and outlet, was found in the Pre-Peak and Peak Reproductive groups at a much higher rate than the Post-Peak with a prevalence rate of 8.0% (n=2/25) within the Pre-Peak and 6.8% (n=10/148) within the Peak Reproductive group. Misalignment of the pubic symphysis was only noted within the Peak Reproductive group (Figure 83, Figure 84).

*Figure 76. Prematurely Fused Coccyx (PC611)*

*Figure 77. Malformed sacral ala with a Transitional segment (KH131).*


*Figure 78. Lumbarization (VR30).*

*Figure 79. Sacralization (AN262A).*

*Figure 80. Assimilated pelvis, lateral view (P1348).*

*Figure 81. Assimilated pelvis with Transitional segment, posterior view (P1348).*

*Figure 82. Extreme sacral curvature (QF56).*

*Figure 83. Misalignment of the pubic symphysis in a female pelvis (RR5686).*

*Figure 84. Misalignment of the platypelloid female pelvis (CL79).*

#### *6.4.4.3 Additional Pathology: Cribra Orbitalia*

A total of 270 individuals aged 13.0-44.9 were examined for signs of cribra orbitalia an indicator of general health and nutrition (Table 30, Table 31). While scores ranged from 1 to 5, only individuals with a score of 2 or higher are included. There was no division between active and healed cribra orbitalia within the sample. When examined by age and reproductive group the 16.0-17.9 age group had the highest prevalence rate (46.4%) and the 25.0-29.9 had the lowest (18%). Although there is a decline in the 25.0-29.9 group, the prevalence rate rises back to 31.1% among the 30.0-34.9 group. Within the reproductive groups, the rates are highest among the Pre- Reproductive group with a prevalence rate of 41.6%, lowest in the Peak Reproductive group (25.5%), followed by the Post-Peak Reproductive group (28.2%). Additionally, cribra orbitalia can be the result of the bodies stress to successive pregnancies as iron levels are influenced by the fetal demand for nutrients and can result in anaemia in pregnant women (Redfern, 2002). This may be the cause for high rates of cribra orbitalia women over the age of 30.

*Table 30. Cribra Orbitalia by Age Group.*

| Age Group | Number of Individuals | Number of Orbits | Number of Orbits with Cribra Orbitalia | Rate of Cribra Orbitalia |
|---|---|---|---|---|
| 13.0-15.9 | 17 | 32 | 13 | 40.6% |
| 16.0-17.9 | 15 | 28 | 13 | 46.4% |
| 18.0-19.9 | 7 | 12 | 4 | 33.3% |
| 20.0-24.9 | 29 | 51 | 16 | 31.4% |
| 25.0-29.9 | 73 | 139 | 25 | 18.0% |
| 30.0-34.9 | 71 | 135 | 42 | 31.1% |
| 35.0-39.9 | 36 | 69 | 19 | 27.5% |
| 40.0-44.9 | 22 | 41 | 12 | 29.3% |
| **Total** | **270** | **507** | **114** | **22.5%** |

*Table 31. Cribra Orbitalia by Reproductive Period*

| Reproductive Group | Number of Individuals | Number of Orbits | Number of Orbits with Cribra Orbitalia | Rate of Cribra Orbitalia |
|---|---|---|---|---|
| Pre-Reproductive | 39 | 72 | 30 | 41.6% |
| Peak Reproductive | 173 | 325 | 83 | 25.5% |
| Post-Peak Reproductive | 58 | 110 | 31 | 28.2% |

# 7 DISCUSSION

While archaeology and other social sciences are attempting to overcome the inherent androcentric bias presented by previous scholarship, there remains a distinct lack of discussion regarding the female life course as outside the idealized version of mother, wife, or *matrona* presented by previous scholars. Roman authors, almost all educated males, wrote about women who were bound by the law and their *paterfamilias*; however, the extent to which such concepts influenced Rome's provinces remains heavily debated. In Roman Britain, androcentric use of primary and secondary sources has resulted in misconceptions such as women being married at 15 years of age (Watts, 2005) without evidence to support these claims. Although women in Roman Britain likely experienced gendered identities from a young age, a bioarchaeological perspective places their biological sex at the forefront of understanding their identity, as when their 'gender self-categorization' is usually unavailable. This can be accomplished by examining the female life course from a feminist or gender theory perspective and by focusing on the key transitions a biological female would be expected to undergo throughout their life regardless of their gender identity.

## 7.1 LIMITATIONS

Outside of issues commonly found within the field such as relating biological sex to gender identity while simultaneously considering gender roles as social or cultural construct, the primary limitations of this study are a sample group of non-survivors along with those related to methods and access to well-preserved materials. Although a number of standardized published methods are available for ageing and sexing both adults and non-adults, within these methods there is much debate on accuracy and appropriate use. Among non-adult skeletons, dental ageing (Moorrees, et al., 1963a) results in a grey area between 17.7 and 19.5 years of age when the roots of the third mandibular molar are complete as this is the last remaining dental method to determine a specific age for an individual. The ages between 16.2, when the third molar root reaches ½ length and 25.0, when annular ring formation is generally complete is an extremely important period in the life course for women. Therefore, it was necessary to utilize ageing methods such as annular ring formation, which overlapped between the traditional non-adult ageing methods and those used in adult populations such as the auricular surface (Buikstra & Ubelaker, 1994) and pubic symphysis (Brooks & Suchey, 1990). Determining the sex of non-adults has consistently been a highly debated topic, and although new technological developments such as the use of aDNA and peptides (Stewart, et al., 2017) can provide alternatives to osteological methods, it is possible to rely upon skeletal changes to determine sex.

Of the 11 separate identifiers examined, those of the pelvis were considered to be the most consistent when compared to other cranial features. However, when sexing non-adults, great care must be taken to select the correct methods for each age group to ensure the highest accuracy rates possible, in addition to any skeletal changes common within the sample which may influence results including gonial flaring in Roman women from Poundbury Camp, a trait commonly associated with males of all ages. Even with appropriate methods which align to specific age groups, there can be difficulty when using them in the field. For example, sexual dimorphism of the distal humerus (Rogers, 1999; 2009) has a high accuracy rate (76.6% to 88.0%) for sexing adolescent females (Falys, et al., 2005); however, it requires the ossification of the medial epicondyle which occurs between 9 and 15 years of age in females, limited the method to older adolescent females. Lastly, the arch criteria as published by Sutter (2003) and Schutkowski (1987) can achieve an accuracy rate of 100% but this was the most difficult method to determine among the 11 non-adult sex identifiers used within the study due to preservation issues.

Identifying menarche requires an iliac crest which has ossified but not yet fused to the ilium (Shapland, et al., 2015). While in modern populations this can be observed via radiographs, in past populations the iliac crest is rare and was only found in four individuals within the puberty subsample. Additionally, assigning a pubertal stage requires the ability to determine the stage of cervical vertebra maturation, which can be complex as the three vertebrae do not develop uniformly and can result in a range of stages. This issue was overcome by using 3 or more features associated with puberty including at least one non-cervical vertebra feature before assigning a puberty stage.

Assigning a pelvic typology and obstetric measurements traditionally requires excellent preservation to articulate the pelvis for measuring. However, in skeletal remains the pelvis is often fragmented particularly at the pubic symphysis and ischium. Metric methods commonly (Turner, 1885; Thoms, 1936; Bull, 1949) depend upon a complete pelvic brim, whereas methods proposed in this study allow for a fragmented pelvis to be including for typology and obstetrics. Depending on preservation level this allowed for a larger sample. Nevertheless, over 50% of the individuals set for initial examination were found to have poor preservation of the pelvis and could not be used. Obstetric measurements are also a debated topic, as in modern populations the assumption is that in developed countries (HICs, NICs or MEDCs) women have access to a range of medical interventions such as caesarean sections. However, in past populations access to medical intervention varied widely even during similar chronological periods or geographical regions. Two methods were used, one relying on fetal size (Bull, 1949) and the other on modern clinical methods (Cunningham, et al., 2010), along with clinical

literature taking from the early 20th century (Leavitt, 1913) which align with the availability of medical intervention available to women in Roman Britain.

Access to well preserved and organized collections proved to be a limitation, particularly due to the closures of various museum collections for reorganization, unpublished individuals from newer collections and missing individuals from older excavations. As the majority of methods used within the puberty and childbirth sections of the study are new, there is no published information which would have allowed for them to be included in either the puberty or childbirth studies.

## 7.2 Demographics

The age of females included in the sample peaks at 25.0-29.9 (n=107) and 30.0-34.9 (n=104), both of which are within the Peak Reproductive period. This may be a reflection of obstetric hazards or issues with ageing methods pulling adults towards the middle age ranges. The decrease in number of individuals as they approached the peak reproductive period alludes to a relatively healthy adolescent population who had survived the perils of childhood. Additionally, the decrease in the number of older individuals, those in the 35.0-44.9 cohort and who had survived the peak reproductive period, suggests that as they approached menopause women continued to face fewer hazards. However, the lower numbers could also represent the resulting smaller population which would have survived the peak reproductive period.

Height is a reflection of genetics and health with approximately 20% of an individual's final height determined by external factors such as diet and health (Perkins, et al., 2016). Women in Roman Britain had a mean femoral length of 41.5cm with a range between 35.9-47.9cm resulting in a mean stature of 156.6cm ± 3.72 and a range of 142.8-172.4cm. This supports Gowland and Walther (2018) who found women in Roman Britain had an average femoral length of 41.2cm and Roberts and Cox (2003), who state that women in Roman Britain on average were 159cm tall. This places Roman women a few centimetres shorter than the modern English population which has an average stature of 161cm (NHS Digital, 2010) and individuals in Anglo-Saxon Britain who had a mean femoral length of 43cm (Gowland & Walther, 2018). However, this increase in stature during the Anglo-Saxon and modern populations may reflect immigration into Britain from various. For example, Anglo-Saxons who arrived in Britain from Germany, Denmark and The Netherlands are one of the tallest modern populations (NCD Risk Factor Collaboration (NCD-RisC), 2016).

Body mass ranged from 40kg to 75kg with a mean body mass of 57.5kg for women between 13.0 and 44.9 years. This resulted in a mean BMI (Body Mass Index) of 23.4 and a range of 19-

28 which represents a healthy population that is unlikely to be suffering from poor diet. This is further supported by low rates of cribra orbitalia for the majority of sites used within the study and low rates of stress markers for women across Roman Britain (Redfern, 2002). Therefore, it is unlikely that poor nutrition based on calorie consumption or health related stress in childhood is the cause of short stature among Roman women. However, individuals from Poundbury Camp had a mean femoral length of 40.7cm, nearly a full centimetre shorter than the average, and this may be a reflection of the high rates of anaemia, tuberculosis and other diseases within the non-adult population (Rohnbogner & Lewis, 2017).

Additionally, high rates of cribra orbitalia among girls during puberty could reflect a diet low in B12 which is found primarily in animal products. The results suggest a diet based on cereals, fruit and vegetables. This is supported by ancient authors who recommend simple foods and little meat for adolescent girls. Finally, stature and other stress markers including cribra orbitalia infer a geographic imbalance for individuals living in certain areas of Roman Britain verses a negative gendered experience. Based on the results of this study in relation to health and stress during childhood and adolescence, there is little evidence to suggest lack of access to foodstuffs based gender, for example girls had BMI's within the normal range and were likely consuming enough calories; however, rates of cribra orbitalia suggest that they had a diet insufficient to meet their nutritional needs at specific points during the life course which resulted the inability of an individuals body to manage or support red blood cell production. Women who experienced cribra orbitalia as adults could show the effect of multiple pregnancies in quick succession which brought forth an underlying nutritional deficiency as the body attempted to cope with demands of the fetus. Patriarchal societies, including the Romans, who value successful pregnancies as the most important aspect a woman can contribute to society can result in more multiple pregnancies. With women being praised for large families, in Rome honours were given for five or more living children, women were encouraged to have a large number of pregnancies taking into consideration the 30% death rate among infants, suggests women would have needed to have a child roughly every two years during their peak reproductive period. However, there is evidence from Roman writers that women had some agency over their own bodies and could attempt to limit the number of children and the spacing between pregnancies. Additionally, the necessity of passing a law giving honours to those women with large families suggests that having five or more living children was uncommon.

## 7.3 Pelvis Typology

Dating back to the 19th century, pelvis typology has had a long history in biological or physical anthropology. Initially it was used to develop understandings on racial backgrounds and difficulties in childbirth, understanding the role the pelvis shape or type plays in fetal rotation

and childbirth outcomes. In modern populations it is understood that there are a wide range of typologies, many of which mix characteristics from multiple pelvis types (Walrath, 2003). However, when exploring past populations based on skeletal remains, which are often fragmentary, it is difficult to determine which of the combination shapes a pelvis falls into. The primary issue when using currently published methods stems from the difficulty of developing a metric formula that can account for the inlet, midplane, outlet and overall shape. The visual method is particularly helpful when working with skeletal remains because an incomplete pelvis can still be assigned to one of the four main categories. Going forward, metric measurements may be able to take into consideration the 3D shape of the pelvis. Due to the fragmentary nature of skeletal remains visual typology shows the promise but needs further studies to determine inter-observer error rates and take into consideration combinations of the four main pelvis types (Walrath, 2003).

### *7.3.1 Developmental Obstetric Dilemma (DOD) Hypothesis*

Throughout the life course the pelvis changes shape to accommodate bipedalism and obstetric demands, this is referred to as the DOD hypothesis. As a woman approaches her reproductive period, it is expected the pelvis would begin to favour a successful childbirth over efficient locomotion which is promoted as a narrower pelvis; however, this idea has long been challenged as outdated (Warner, 2014; Warner, et al., 2015). Although this sample represents those who did not survive, the typology reflects a change which occurs throughout the period of development leading up to and during puberty and again once females approach menopause. However, this change is not limited to the width of the pelvis but a change in the overall shape. If the pelvis only widened the result would be an increase among the platypelloid pelvis type. However, the highest number of android pelvis types was found within the 18.0-19.9 age group. The reduction of android pelvis types throughout the peak reproductive period, followed by an increase within the post-peak reproductive group, shows how the pelvis changes shape when approaching menopause will have a change in the shape of their pelvis.

The results support the developmental obstetric dilemma (DOD) hypothesis which states that pelvic morphology actually reflects the changing obstetric needs throughout the life course verses the Obstetric Dilemma theory which focuses on locomotion (Huseynov, et al., 2016). As with the original clinical study, which used 275 individuals from European hospitals, the Romano-British females showed similar pelvic changes as they approached menarche (10.0-12.0 age group) and again at perimenopause (40.0-44.9 age group). The shift within the female pelvic proportions stems from the sacrum and the ischiopubic region undergoing eversion and the iliac blades undergoing inversion which cause the anteroposterior dimensions of the midplane and outlet along with the transverse dimensions of the inlet and outlet to become

larger. Within the Romano-British sample the rate of women with a contracted pubic arch angle rose from 3% (n=33) in the 30.0-34.9 age group to 20% (n=15) among the 40.0-44.9 age group. The changes observed within the female pelvis also result in a change of typology as after the peak reproductive period the female pelvis then returns to the android shape, most closely associated with males. The rate of gynaecoid pelvises dropped from 50% among the Peak Reproductive group to 39% among the Post-Peak Reproductive group while the rate of Android pelvis shapes increased from 10% to 20%.

## 7.4 Puberty

Ancient historical and modern secondary sources suggest that external signs of puberty began between 12 and 13 years old, followed by menarche at 14 years of age (Harlow & Laurence, 2002; Hersch, 2010; Emperor Justinian, *Institutions* I. tit. 22; Soranus, *Gynacia* 1.20). Within the puberty sub-sample (n=141) the Initiation stage had a mean of 11.6 years; during this stage there are no external cues for the hormonal changes occurring. It is during the Acceleration stage, which had a mean age of 12.1 years, that external development beings and often include the first signs of puberty such breast bud development in girls and some slight changes in body hair. It is also anticipated that girls would begin to gain weight during this stage; however, this cannot be determined due to the limitations of current stature methods which require a fully fused femur. For Romans, external cues such as breast and hair development along with changing proportions of body fat would signal the beginning of puberty. Additionally, the results of the study align with the ages suggested by authors such as Soranus. Menarche was an important point of transition for a girl; based on the ossification of the iliac crest and other skeletal development it occurred at approximately 14 years of age. Soranus mentions menarche should be expected in a girl's 14$^{th}$ year, suggesting that girls in Roman Britain were reaching similar developmental milestones as those in Rome.

As a mix of biological, socio-economic and environmental factors including diet and overall health determines the age at which an individual enters puberty. This link potentially shows a similarity on this level between girls living in Rome and those in Roman Britain; however, this could also be due to the urban nature of the sites chosen and the influence of migration including those from Italy to Britain. The range in age at which girls reached Transition or PHV (11.0-16.5 years) and Deceleration (13.3-24.9 years) show the extent in which pubertal timing varies among individuals. Although this could represent a difference in social class or health since many individuals within the sub-sample would not be considered 'delayed'. Despite physicians such as Soranus focusing on the wealthy elite who had access to a range of foodstuffs, a similar age at milestones such as menarche and PHV could suggest that even

poorer girls living in Roman Britain had access to enough calories to maintain a healthy weight and physical development on par with wealthy girls in Rome and the surrounding region.

Across the entire subsample low rates of grave goods may reflect a shift in burial practices and there is no link between individuals in various puberty stages and grave goods. For instance, no individuals in stage 1, 3 or 4 were found with grave goods; whereas individuals in stages 2 (n=3), 5 (n=2) and 6 (n=4) were found with a range of items including jewellery, coins and pottery. The inclusion of jewellery in 83% (n=5/6) of female graves with grave goods between the ages of 10.0 and 24.9 suggest that it was commonly worn by girls or served as a symbolic nature for those who prepared the bodies for burial. The items, including armlets, rings and beaded necklaces, further gender females with Roman society although males wore similar items as well and no items inferred a distinct identity separate from the group such as migration or socio-economic class (Carroll, 2013).

Within the puberty subsample, the 16.0-16.9 age group based on dental ageing represented 27.5% (n=14) of the sample. The high rate of death among women in this age group is also marked by a change in pelvis typology with a sudden decrease in the rate of gynaecoid pelvis types and the beginning of an increase in platypelloid and android shapes. This shift may represent early developers who went on to have trouble in childbirth or who were slightly delayed and, therefore, their pelvis would not have finished the morphological changes suggested by the DOD hypothesis. Additionally, the rate of contraction among females shifts from 75% (n=9/12) in the acceleration stage to 57.1% (n=4/7) in the transition (PHV) group before reaching 10% (n=1/1) in the deceleration stage. This change aligns with the growth and development of the pelvis during puberty, particularly during PHV. The mean age of PHV is 14.0 years, however, for the deceleration group it was 16.0 years and given that it takes approximately two years for a woman to begin regular ovulation after first menses the result would be that women were unlikely to be pregnant prior to that stage.

When placed in a wider context (Figure 85), women in Roman Britain were reaching menarche earlier than other past populations (Arthur, et al., 2016; Shapland, et al., 2015; Doe, et al., 2017) but slightly older than modern populations (Wellens, et al., 1990; Anderson, et al., 2003; Al-Sahab, et al., 2010; Rokade & Mane, 2009). Age at menarche for Roman Britain is most similar to the age found among a rural Indian population, primarily composed of migrants and agricultural labourers, in a developing country (Pandey & Pradhan, 2017). Women and girls living in urban centres were likely healthy with adequate diets when compared to urban girls of the medieval period (Shapland and Lewis, 2015). Isotopic analysis shows that women were coming to Roman Britain from throughout the Empire and this may have influenced not only

their overall health but their pubertal timing, social customs and dietary choices (Leach, et al., 2009; Eckardt, et al., 2009; Eckardt, et al., 2014).

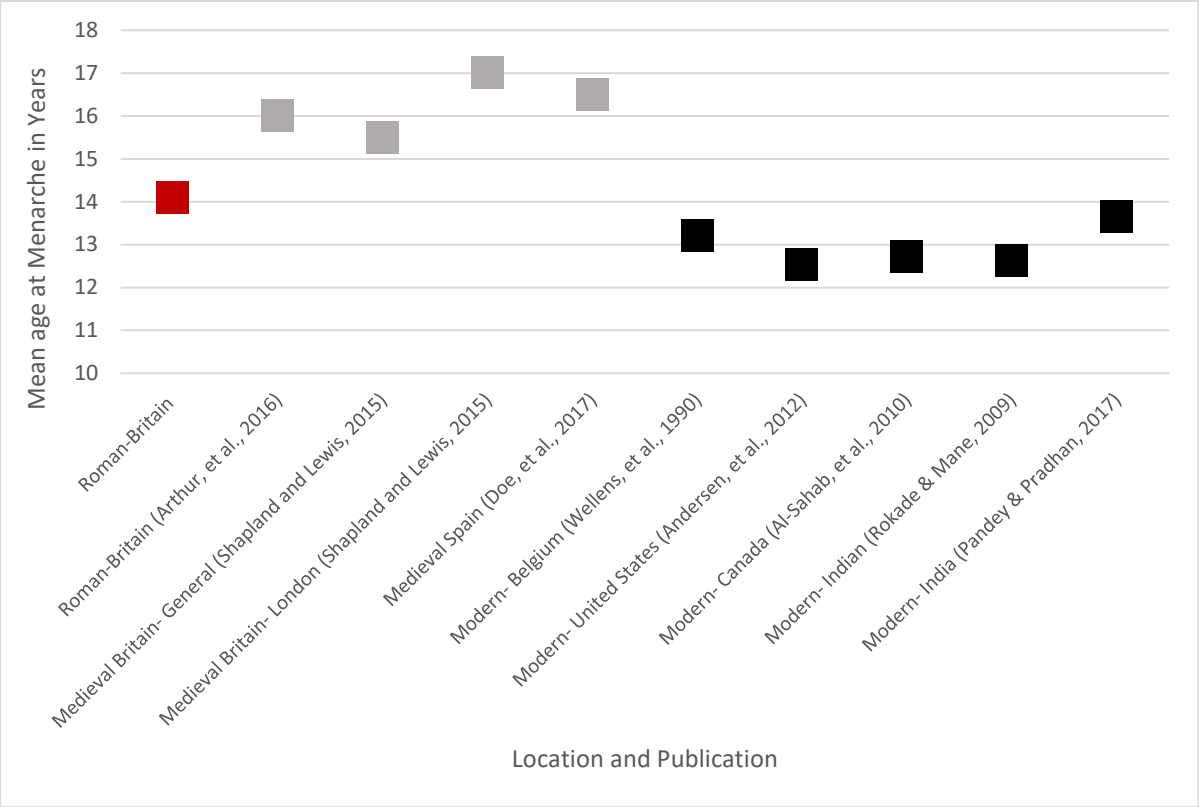



*Figure 85. Chart showing the range of mean ages at menarche. The current study is highlighted in red, while other archaeological populations are noted in grey, modern populations are noted in black.*

Estradiol levels in females, which reduce global grey matter volume and increase in white matter in puberty hinders learning complex or abstract material (Adeyemi, 2014). In the Roman period, girls were educated until puberty and while this cessation may be the result in girls exhibiting difficulties in comprehending new material in the shift from play, observational learning and basic subjects to the learning style of the male only rhetorical schools, it is more likely to be the result of patriarchal social norms. In any case, in Roman Britain the evidence for widespread education outside of major urban centres and wealthy villas remains lacking. The increase in white matter results in a deeper understanding of social cues which would assist in girls transitioning into active roles in the wider society during adolescence (Adeyemi, 2014). Additionally, among modern populations, half of all mental disorders in adulthood begin by age 14 or approximately one to two years after menarche as a woman enters the final stages of maturation (World Health Organization, 2018). This can be increased by precious puberty which has been shown to increase rates of depression in addition to poorer health (Angold, et al., 1999). The final stages of puberty are also linked to a rapid rise in estradiol (Ikegami, et al.,

2001), which- when combined with the potential of becoming eligible for marriage and moving away from their paternal home or a first pregnancy- would have only contributed to the mental strain young Roman women faced during adolescence. While mental health is not often discussed in the classical world (Harris, 2013) aside from references by Soranus on mania and melancholy (Drabkin, 1951), nor are their published methods for examining mental health on the skeleton, it would have had a profound impact on the way a woman interacted with her family, potential children and society.

## 7.5 CHILDBIRTH

The modern perception of pregnancy has been influenced by tales of the 'rachitic pelvis' during the Victorian era and an increased reliance on Caesarean sections in modern populations (Wells, 1975). Examining pregnancy and childbirth in past populations will always be mired in difficulty due to preservation issues, number of females interred with viable neonates and known complications associated with various ageing methods. This has also resulted in the oversimplification that higher rates of young, reproductive age females in cemetery samples are the result of childbirth related complications. In addition, the move away from using race-based studies which provide a plethora of information on pre-industrial and industrialising societies further contributes to a lack of available methods to analyse obstetric hazards from an unbiased point of view. However, it is possible to approach pregnancy and childbirth in past populations to develop an understanding of obstetric hazards based on skeletal markers present in females. New approaches which incorporate a range of qualitative and quantitative methods which are removed from the androcentric nature of earlier studies, such as combining birth stories along with obstetric measurements and access to care, can then be used to gain a better understanding of how an individual approaches childbirth as a 'lived experience' across the life course.

Higher rates of contraction have been noted in studies which employ or suggest using modern or late 20$^{th}$ century measurements to determine contraction (Kurki, 2011; Walrath, 2003) and may account for the overdependence and simplification asserting that deaths of women occurred due to an obstetric hazard. The results of this study, which relied on a variety of methods including pelvimetry and pathological skeletal markers to explore the potential hazards women faced in pregnancy and childbirth, show that for many women there is little evidence to support the overarching claim that they died due to childbirth related complications which can present on the skeleton.

### *7.5.1 Pelvic Development*

The age at which a female can successfully give birth does not necessarily coincide with the onset of menarche. Despite only representing 11% of births in the world (World Health

Organization, 2018) the leading cause of death among modern 15-19-year-old girls living in developing countries stems from pregnancy and childbirth related complications during the 3 to 5 years after menarche. Although only 20% of death in childbirth are directly related to a contracted pelvis or CPD, among women in Roman Britain aged between 13.0-15.9, 100% of the sample was either 'At Risk' (33.3%) or 'High Risk' (66.7%). It was only in their late-teen years that the pelvis becomes developed enough to successfully deliver vaginally. The rate of contraction quickly falls from 42.9% (At Risk) and 35.7% (High Risk) 16.0-17.9 age group reaching 16.7% (At Risk and High Risk) in the 18.0-19.9 age group. The reduction at 16.0 and complete lack of Gynaecoid shape pelvises among the 17 and 18-year-old puberty subsample may represent complications in childbirth since these are non-survivors. Therefore, it is doubtful that the majority of women were married or pregnant prior to 18 years of age as it is highly unlikely that they would have survived childbirth. This would go on to influence the number of pregnancies the woman had throughout her reproductive period with a lasting impact on family size and population growth.

Among the adults, a pattern emerged within the data showing that women aged 25.0-29.9 (n=107) and 30.0-34.9 (n=104), were the most common within the sample. It is misleading that younger women are found in higher rates due to potential complications during their first pregnancies, although, they are at a higher risk for a contracted pelvis during their teen years. Additionally, the rate of contracted pelves fell to 14.3%/1.5% (At Risk/High Risk) among women aged 35.0-39.9 at death. This alludes to women having a higher risk of death during their first pregnancy or childbirth from a contracted pelvis. However, older women succumbed to complications related to being a multipara, skeletal changes associated with ageing, obstetric hazards which do not present on the skeleton, such as gestational diabetes and haemorrhaging, or from non-childbirth related causes (Cunningham, et al., 2010).

Delprete (2017) found that the traditional female gynaecoid and male android pelvis types were not sexually dimorphic with 59.3% (n=108) of females determined as android in shape. The primary issue with this determination is the reliance on Thoms (1936) which tends to overemphasise the android pelvis due to the formula used. According to Kolesova and Vētra (2012) the 'narrow' pelvis type or android was the most common in younger females between 18-25 years 50% (n=17). However, this study relied on three pelvic clusters determined via measurements taken from radiographs. Based on the visual method used in this study, the rate of android pelvises remains low across all age categories aside from 16.0-17.9 when it reached 33.33% (n=6). When examined from a life course perspective, the android shape pelvis types peaked at 14% among the Post-Peak Reproductive group. The pubic arch angle ranged from 70° to 140° with a mean of 107.7° (n=101) which is slightly higher than those found within the

Gilboa (2013), although this relates to the inclusion of younger individuals in the study resulting in individuals with a wider range. The change in degrees throughout the life course could be related to the changing of pelvis shapes with age as evidenced by the lower rate of gynaecoid pelvis types and an increase in other pelvis shapes among the Post-Peak Reproductive group.

## 7.6 Obstetric Pathology and Complications

The pathology of pregnancy and childbirth can be challenging as there are a wide range of pressures on the skeleton which can influence a successful delivery. Previous studies (Cox, 1989; Holt, 1978; Snodgrass JJ, 2003; Ubelaker DH, 2012) have determined that many of the skeletal markers associated with parturition are also found to varying extents in male populations and are influenced by body mass. Osteophyte growths in the lumbosacral and sacroiliac areas also stem from similar influences, including the effects of the pregnancy hormone relaxin which causes instability in the pelvis. As a result, osteophyte growths inappropriate to use as parity skeletal markers, however, bone growth in this region can also go on to influence subsequent births as the muscles and ligaments are unable to move and stretch depending on the severity of growths. Additional approaches can stem from examining pathology which impacts the space available for a fetus in the pelvis such as fusing of the coccyx. As might be expected, the rate of joint diseases increased with age while developmental pathology peaked among the Peak Reproductive group likely in relation to childbirth. Overall, the pathological investigation suggests that risks among younger females stemmed from development causes relating to the size or stability of the pelvic inlet, midplane and outlet as these would have prevented a successful first pregnancy. Older individuals are influenced by changes in the pelvis associated with ageing or previous vaginal (natural) births.

Within archaeological populations, one of the major complications of determining if a woman died in childbirth is the rarity of finding near or at full term fetal remains inside the pelvis, particularly the birth canal (Lieverse, et al., 2015; Willis & Oxenham, 2011; Malgosa, et al., 2004). Adding further complexity is the habit of removing fetal remains from the womb in cases of an unsuccessful childbirth (Gilchrist, 2000). Among women buried with fetal remains, younger individuals were more susceptible to complications from a contracted pelvis or pelvic shape (QF56, CLH79) while older individuals continued to potentially remain susceptible to pelvic shape as it can change throughout the life course but contraction was no longer an issue except in extreme circumstances. Although the platypelloid shape was unexpectedly not the highest at risk from a contracted pelvis, this fell to the android shape in most age categories, it still presents with obstetric complications due to fetal rotation through the birth canal. As it had

the highest rate among females found with fetal remains and should be considered a shape which is at risk in future studies.

### *7.6.1 Death in Childbirth*

Within the sample (n= 402), eight individuals were buried with remains determined to be that of viable neonates or infants based on published material (Table 32). The specific ages of the fetuses were not provided in some cases due to preservation but have been noted as either infant or neonate based on original excavation reports. An individual SS7648 from Stane Street, an excavation site associated with Roman Colchester, was found buried with full term triplets. All individuals including within the study were classified according to pelvis type with platypelloid (n=4, 50%) being the most common while gynaecoid was only found in older individuals (35.0-39.9 and 40.0-44.9). These findings do not align with the overall population and show a distinct pattern due to a higher proportion of platypelloid pelves, a low rate of gynaecoid pelves and a younger individual with an android shape for those with contracted pelves who were buried with fetal, neonate or infant remains. This aligns with the findings of Thoms (1937) whose study suggests platypelloid pelves were more likely to require caesarean sections (19.0%) or general intervention (33%).

Of the eight individuals (Table 32), CLH79 from Colchester is the only female with a contracted pelvis and a near full term neonate. This individual showed no signs of pathology associated with childbirth complications aside from the contracted pelvic measurements at the brim area (75.13mm), however, the transverse inlet (99.8mm) and conjugate (95.9mm) were just above the 95mm suggested cut-off for determining an ‘High Risk’ contracted pelvis. Prior to surgical options, this individual would have had approximately at 24% chance of requiring intervention (Leavitt, 1913). Modern clinical methods suggest that this individual would be allowed a ‘trial of labour’ but would be noted as a potential caesarean section should it be necessary (El-Mowafi, 2017).

Burial QF56, from Queensford Farm, is the youngest individual with a dental age of 17.3 years and, whilst the pelvis was not contracted, the sacral breadth of 97.94mm is shorter than the average of 116mm for European women (Turner, 1886) and presented with a steep anterior curve at the third sacral vertebra which could possibly influence success in childbirth; however, poor preservation prevented obstetric measurements from being conducted. Older individuals including GPL524, SS7648, AS20, CA1190 present with sacro-iliac osteophytes (n=2) or lumbar osteophytes (n=2) which can be indicative of previous pregnancies, weight gain, labour or ageing and can influence successful vaginal childbirth due to the inability for muscles and ligaments to perform as expected.

Two women, AS51 and SS7648, would be considered 'Low Risk' based on their stature being under 159cm and SS7648 is 'At Risk' due to being under 155cm. None of the women were at risk due to BMI although SS7648, pregnant with triplets, shows the highest BMI of the group. This shows that while BMI should be further studied, as it shows promise as a way to understand the ways in which female body changed during pregnancy in past populations.

*Table 32. Females buried with neonates and infants.*

| Burial | Site | Age | Classification | Contracted | Fetus | Stature/Body Mass/ BMI | Pathology |
|---|---|---|---|---|---|---|---|
| **QF56** | Queensford Farm | 16.0-17.9 | Android | N | 35-32 weeks | - | Sacral curve |
| **CLH79** | Lankhills | 20.0-24.9 | Platypelloid | High Risk | 31-34 weeks | - | -- |
| **AS51** | Ashton | 20.0-24.9 | Anthropoid | - | Infant | 157.6cm, 51.1kg, 20.6 | - |
| **SS7204** | Stane St | 25.0-29.9 | Platypelloid | N | Neonate | 156.9cm, 54.3kg, 22.0 | - |
| **GPL524** | Gambier Parry Lodge | 30.0-34.5 | Platypelloid | - | Infant | 163.8cm, 64.0kg, 23.9 | Vertebral Osteophytes |
| **SS7648** | Stane St | 35.0-39.9 | Platypelloid | N | 38-40 weeks, triplets | 154.4cm, 61.3kg, 25.7 | Sacro-iliac Osteophytes |
| **AS20** | Ashton | 35.0-39.9 | Gynaecoid | - | Infant | - | Sacro-iliac Osteophytes |
| **CA1190** | California | 40.0-44.9 | Gynaecoid | - | Neonate | 160.6cm, 55.4kg, 21.5 | Vertebral Osteophytes |

## 7.7 Targeted Questions

### *7.7.1 How can bioarchaeological studies incorporate feminist and gender theory, alongside at life course approach?*

Classical sources, particularly written sources, are androcentric and limited when discussing the roles of women from their own perspective. A feminist approach attempts to incorporate this missing female voice whenever possible, and within the field of biological anthropology or bioarchaeology, incorporating female skeletal evidence alongside primary written sources such as Soranus and Galen allows for a holistic approach. If feminist theory aims to bring to light female voices, gender theory focuses on how a society interprets the associated gender roles and identity. While it is commonly understood that biological sex and gender are different, it is also important to note that neither are truly binary. Although for skeletal interpretation a single sex is assigned with little leeway, aside from possible female, possible male or undetermined. Technological advances in aDNA ought to allow for rarer chromosomal traits aside from the standard XX/XY, for example XXX, to be considered. However, biological sex does not always

equate to outwards appearance and assigned roles within a society which further complicates the role of a bioarchaeologist discussing women (Geller, 2008).

Understanding the idea that gender is a culturally constructed role is vital to comprehending or interpreting the lives of women in situations where primary written evidence is limited. As there are very few surviving sources written by women in Roman Britain, this is particularly essential because male writers or scholars often focus on the idea of an 'ideal' woman within the given society. Gender theory also allows for the understanding that women's contribution, while perhaps less monetary in value, is vital for a successful society. Additionally, women are not 'found' within the archaeological record, they have always existed. It is the bias of previous scholars and excavators which have focused on other aspects of history and past populations resulting in a banal discussion on women until third wave feminism and the popularization of gender theory. Their own bias has resulted in theories that Roman women married as young teens because of their sexual desires, a statement most likely born out of the time period of the author not factual evidence (Hopkins, 1965). Working within human remains from past populations comes with limitations as well, such as understanding how an individual viewed themselves and their own interpretation of their gender identity along with their sexual identity.

Relying on a life course perspective can be difficult when working within the archaeological record as they are often longitudinal studies. In cross sectional studies, individuals represent an entire period, in this case the four centuries Britain was under Roman administration. The social and cultural expectations would have changed, potentially drastically, between the 1st and 4th century CE. What the life course approach can lend toward the study of women in any past population, is the idea of 'developmentalism' and the longue durée. In developmentalism the stages of life which all individuals pass through are examined, including key events and transitions. This is a gendered approach because males and females have different stages, events and transitions. The longue durée or focusing on long term trends helps to overcome the lengthy time period, which can span centuries, which archaeological studies frequently rely. Therefore, when examining women in any past population it is helpful to understand how the primary written sources may be lacking due to bias of previous scholars or because they have not survived and how this can be overcome by inclusion of gynocentric events and transitions, in this case puberty and childbirth.

Future work on examining women from past populations could approach the life course through both bioarchaeological evidence including development, isotope analysis, or aDNA in conjunction with grave goods and burial rites. This would provide a potential bridge between biological sex and socially constructed gender.

### *7.7.2 Are bioarchaeological findings, determined by new methods for pubertal timing and age at menarche in females from Roman Britain supported by primary Roman literary sources?*

The main primary written source for gynaecology and general female development is Soranus, followed by Galen and Rufus. However, as physicians to the wealthy elite in and around Rome, their writings only reflect a small portion of the population. Additionally, to understand the role of women the *Lex Iulia* and other laws provide a glimpse into the treatment of women in Roman society. Soranus (*Gynacia*) suggests that girls as young as 13 should prepare for their first menses which typically came during their 14th year. Based on skeletal development from women in Roman Britain, the mean age at menarche is 14.1 years with some girls beginning menstruation as young as 11 and as old as 16 years of age. Thus, for age at puberty and menarche, the written evidence aligns with skeletal development; this may be considered surprising given that Soranus focused on upper-class families in Rome while the evidence from Roman Britain comes from a range of urban and semi-urban sites.

Age at marriage is closely linked to pubertal timing and menarche. However, the written sources on marriage in Rome date to the early 1st and 2nd centuries CE, and the majority of available inhumation burials in Roman Britain date to the 2 through 4th centuries CE. According to 1st century laws, which attempted to encourage Roman citizens to procreate, the *Lex Iulia* required the families of unmarried women between 20 and 50 years of age to pay a fine, providing additional evidence of the reproductive period of Roman women. This aligns with Soranus (*Gynacia*) who wrote that menarche would continue from 14 until between 40 and 50 years of age, although in some exceptional cases menstruation could continue sporadically until 60 years of age. While laws and ancient writers often agree on age at menarche and menopause, age at marriage is far more complex. The *Lex Iulia*, states girls must be at least 12 years old for marriage and during the 1st centuries BCE and CE, written sources suggest the Imperial family and other wealthy aristocrats often married between 11 and 13 with pregnancy occurring as young as 13 among the elite (Hopkins, 1965). Simultaneously, during the late 1st or early-2nd century CE Rufus wrote that marriage should occur five years after menarche or at 18 as that is when a woman is ready for pregnancy (Rufus, *On Girl's Regimen and on Women's Regimen*). However, these sources focus on the development of upper-class girls often living in and around Rome. Roberts and Cox (2003) suggest that due to economic factors in Roman Britain only 7.5% of women were married by 17 years, 54% by 21 years and 62% by 28 years old. This seems quite high as one of the main functions of marriage in the Roman period was procreation and although there is an economic benefit to keeping women in their paternal home, they would also have had value and a specific role within their husband's home.

Soranus (*Gynacia*) suggests a girl should have her first sexual experience near the time of her first menses, with pregnancy following soon after. This places marriage and pregnancy between 11 and 17 years of age on average due to the mean age of menarche being 14 years old. On the other hand, Rufus (*On Girl's Regimen and on Women's Regimen*) writes that it is dangerous for girls under 16 to conceive and Aristotle, with whom Rufus agrees, writes that 21 years of age is better for a first pregnancy (Hopkins, 1965). Based on pelvic development, the age at which women began safely giving birth is approximately 18 years of age (Figure 86). Additionally, the increase in contraction among the 20.0-24.9 age group also suggests that women were potentially giving birth to their first child during this period. Therefore, the written evidence is supported by the bioarchaeological findings.

### *7.7.3 What age did women in Roman Britain reach menarche and how did this potentially influence their life course?*

Girls in Roman Britain began entering puberty between 10 and 13 years of age, taking approximately 5 years to move from initiation through to completion. Within this transition period, the average age at menarche was 14.1 years but this could range between 11 and 16 years based on skeletal remains of non-survivors. In a society that valued marriage for procreation or alliance among the upper classes it is likely these girls would have entered into a marriage around the time of their first menses; however, for other girls, particularly those living in agricultural areas or those in the farther reaches of the Empire, it is far harder to gauge how Roman customs would have influenced women who were far removed from 'Roman' society. In modern agrarian societies in which child brides, or those under the age of 18, are common, the relationship between menarche and marriage is similar between early and late developers. A study conducted in Maharashtra, India, which has a mean age at menarche comparable to that of Roman Britain (13.7 ± 1.3 years) established a range of 11-27 years for first marriage with a mean age of 18.62 ± 2.25 years (Raj, et al., 2015). Therefore, in Roman Britain, it is likely women married after the age of 12 or 13 years of age. Based on skeletal evidence for the ability for young women to successfully survive childbirth, most would have been married by 18 or 19 years of age, which coincides with a reduction in epitaphs and grave goods by parents for daughters (Hopkins, 1965).

### *7.7.4 Is the developmental obstetric dilemma (DOD) hypothesis supported in this archaeological context?*

The results support the developmental obstetric dilemma (DOD) hypothesis which states that pelvic morphology reflects the changing obstetric needs throughout the life course. Specifically, the female pelvis changes shape to make childbirth easier in the years after menarche and then

as a woman approaches perimenopause, around the age of 40, the pelvis changes shape again to a less suitable shape for childbirth resembling that of a male. While there are a variety of links between fetal size, including head circumference, and weight both of which are inherited from the mother, the problem facing modern populations is from the rise in caesarean sections that influence survival rates (Huseynov, et al., 2016). While during the Roman period surgery was rare, and used as a last resort to save either the mother or fetus but not both, the use of forceps and other early intervention methods by trained midwives may have allowed women who would have died in childbirth to survive and, therefore, pass along this potential obstetric hazard to their children. Within the skeletal sample, evidence for the DOD hypothesis stems from a shift in pelvic typology with a reduction in the platypelloid shape, a potential obstetric hazard and an increase in android and anthropoid types (Figure 87). Both platypelloid and android shapes return to similar levels of girls in the early stages of puberty. The increase in anthropoid shapes among the 40.0-44.9-year age group may also show how the pelvis is in the process of changing to an android shape as both the android and anthropoid have shapes which require a longer anteroposterior measurement. The DOD hypothesis also impacts sexing methods for adults over the age of 40 due to the reliance on male verses female pelvic traits. If further studies support the DOD hypotheses and the shift from a 'female' shape pelvis to a 'male' or android shape with age, the sexing methods used for older individuals will need to be re-examined.

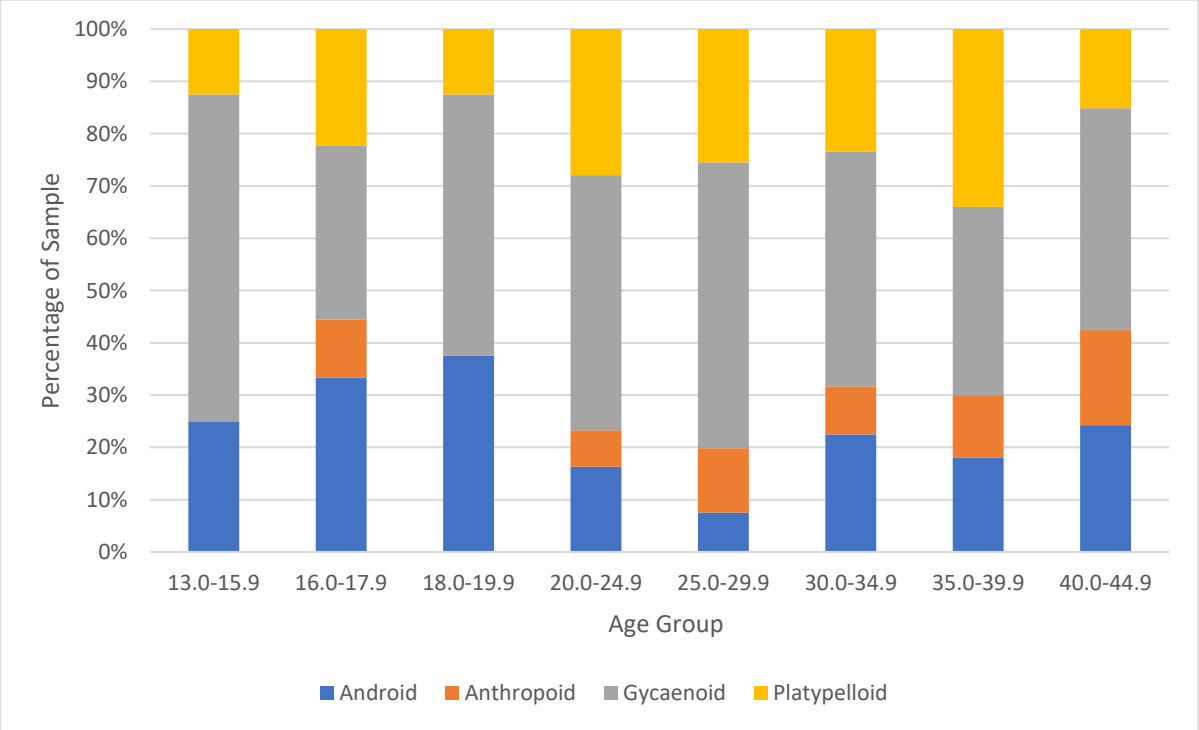



*Figure 87. Pelvis typology by age category.*

### *7.7.5 Does the high rate of females found in archaeological samples correspond to rates of obstetric hazards?*

Within the sample studied, there is a peak among women within the Peak Reproductive period, particularly the ages of 25.0-29.9 and 30.0-34.9, representing a potential peak due to birth hazards. However, the lowest rates of 'High Risk' contraction were found among women aged 30.0-34.9 (1.5%) and 35.0-39.9 (2.9%). Since among modern populations only 20% of obstetric hazards can be observed through skeletal changes, with the other 80% stemming from haemorrhaging, infections and other complications, it is likely this accounts for the low numbers of women within past populations. Additionally, it is possible that sample bias or simple preservation levels accounted for these peaks. While the overall rates suggest a slightly older age at death, there is a rise in contraction rates among the 20.0-24.9 with 31.0% being 'At Risk' and 17.2% being 'High Risk'. This may reflect the likelihood of women who faced an obstetric dilemma or CPD during their first pregnancy, in this case between 20.0-24.9, whereas women in other age categories are either having multiple children and suffering from other complications which can be associated with multiparity such as anaemia, *abruptio placentae*, and preeclampsia (Babinszki, et al., 1999). Therefore, it is likely that a number of women from past populations died from pregnancy or obstetric complications; however, this should also be approached with caution as there are a range of factors which influence success in childbirth. It is easy to make the assumption that women died from childbirth but this viewpoint is also limiting women to the domestic sphere and prevents them from being viewed as part of a wider society which underwent stress such as famine, disease and war.

### *7.7.6 Are findings or methods used within this study suitable for determining parity in past populations?*

While a number of changes potentially related to pregnancy were noted among the pathology, there is no evidence that any of these are linked specifically to parity or parity rates and evidence in support of this was not pursued throughout the study. While skeletal changes such as sacro-iliac osteophytes can be the result of weight gain or pelvic instability during pregnancy and influence future childbirth outcomes, they can also be related to other factors. Previous studies show they have been found to occur in men and to increase with age. However, those formations are frequently located in along the anterosuperior aspect of the sacro-iliac joint (Parmar, et al., 2004; Waldron & Rogers, 1990) whereas osteophyte growth observed in the childbirth subsample are located along the anterior sacro-iliac joint. Future research which examines the location of various osteophyte growths and their relationship to weight and pregnancy would be helpful for discussing if location of growths is related to pregnancy.

### *7.7.7 What pathologies or morphological changes should be considered going forward when examining obstetric hazards?*

Although no morphological changes associated with metabolic diseases such as rickets resulting in a kyphoscoliotic pelvis or other changes, were observed, pelvic changes associated with metabolic diseases can have a large impact on birth outcomes. Among the pathologies observed in the childbirth subsample, sacral changes including sacralisation, lumbarisation, sacral curvature or an assimilated pelvis along with a prematurely fused coccyx are often overlooked in literature discussing obstetric hazards. They can result in birth hazards ranging from contraction, such as with a prematurely fused coccyx, to the inability of pelvic muscles to cope with the demands of vaginal birth. Additionally, malalignment of the pubic symphysis can make both carrying a pregnancy to term and childbirth difficult due to the instability of the pelvic muscles or a contracted anteroposterior measurement due to the angle of the accurate line as it approaches the pubic symphysis and the location of the pubic symphysis itself. The primary complication with determining how these types of skeletal changes influenced past populations is the rise in caesarean sections and the elimination of many birth hazards women once faced.

# 8 CONCLUSIONS AND FUTURE WORK

The primary aim of this research was to explore the Romano-British female life course from an interdisciplinary perspective, with an emphasis on skeletal development in an attempt to overcome limitations resulting from a lack of primary written sources in a field historically plagued by androcentric ideology. The life course refers to a culturally defined sequence of stages that members of that society are expected to pass through, typically beginning with birth and ending with death. The expected Roman female life course consisted of seven major stages ranging from birth to death and included events such as marriage and transitions such as menopause. Limitations to this approach included preservation and lack of access to skeletons from Roman London resulting in a sample size of (n=436). Additionally, previously published studies have refrained from examining this topic due to the new methods utilized for determining puberty from skeletal remains and limited previous work exploring obstetric hazards, resulting in an inability to compare results with other large-scale studies.

Applying an approach incorporating feminist and gender theory to the Romano-British female life course is enhanced through the use of skeletal remains. It results in understanding that females in Roman Britain experienced a gender specific life course which would be different from males. Girls in Roman society were gendered from an early age through play and social interaction within the home by female family members and, depending on social class, household servants. However, girls were also given the opportunity for education and to participate in wider society through religious festivals or other community events. Once gender norms were established and girls reached menarche at approximately 14 years of age their role shifted from the domestic sphere to wider participation in the community as the girl readied for marriage. For many girls this would have resulted in the end of their education but beginning the transitioning into adulthood. Women at this stage were also undergoing immense psychological changes, often dismissed as melancholy that may have impacted their ability to fulfil the expected roles assigned to their gender. Additionally, women and girls who served as slaves or prostitutes would have experienced a slightly different series of events and transitions; however, it is not possible to distinguish these ‘others’ from the wider female population in the sites chosen for this study. Future work, taking a bioarchaeological approach to women known to be from outside the ‘idealized’ female life course would represent a push forward in feminist and gender theory in the field.

Childhood is both a biological and social phenomenon; in the Roman period, children, like slaves, were marginalized from wider society. It should be understood as its own separate social category as it was influenced by geographical location and social status (Laes, 2006). During

this period girls learned their assigned gender roles and the associated duties. However, girls remained in passive roles within the household and society. Adolescents was a period of extreme change, girls moved from a passive role in their families' homes to an active one. This shift allowed them to participate in daily life and help them prepare for marriage. As girls reach puberty it is likely they began to marry, causing them to move from their familial home to that of their husband. In this new environment, girls would need to adapt to yet another change in their expected roles and engaged in active roles within the household and society. It also served as a potential terminus for their education and marked their entry into adulthood.

As adults the majority of women still lacked independence. They moved from the protection of their father or another family member to that of their husbands' *paterfamilias*. Within this environment, they carved out a new life for themselves, learning the traditions and customs of their new family. It was into this foreign environment they raised their children. Women most likely blended their own traditions with that of their husbands' family or if they had travelled to a new geographic location, they might incorporate local customs. This makes it very difficult to determine if women in Roman Britain received the same treatment as those living closer to Rome or within the city itself. What would have remained consistent is the patriarchal society in which the women lived. Across geographic regions, Roman women were expected to be subordinate to their husbands, focusing on the home or a family business and raising children. Children were particularly important if they were eligible for citizenship.

It was only in widowhood or old age where women finally able to control their own money and assert some independence. However, with this freedom came consequences and many elderly women found themselves marginalized, living on the fridges of society. They might have been forced into the household of a child or other relative where the power and status they had as a previous *matrona* no longer applied. However, some wealthy older women were able to exert influence within the arts through *patronage* and in politics by providing funds for campaigns. The final stage in any life course is death; however, drawing conclusions based how woman were treated after death is problematic. Burial customs often reflect the wishes of the deceased's family and do not always demonstrate how people saw themselves during life. Overall, the Romano-British female life course provides a glimpse into the treatment and status of women as they move throughout the different stages, balancing between the social and domestic spheres and shifted from passive to limited active participants in their own lives.

It is highly likely based on skeletal development that girls were entering marriage and motherhood between 18.0 and 24.9 years of age. With marriage, a woman would leave her paternal home and take on a new role within her husband's family along with an active role

within the community which would expand as she had children. This proved a risky time in a woman's life as complications related to childbirth could be expected due to a variety of hazards such including a contracted pelvis. Women under the age of 18 years were particularly at risk for obstetric hazards due to pelvis development. However, there is evidence such as forceps and texts mentioning trained midwives who would have assisted women in labour. This may result in a higher rate of successful vaginal deliveries for Roman women than in other past societies.

Although older women faced separate hazards such as osteophyte growths, it is highly likely that hazards faced by women in the Post-Peak reproductive period stem from mulitparity such as anaemia and preeclampsia in lieu of a contracted pelvis. Socially, a woman's role continued to increase through the life course until she approached menopause when it waned, and the next generation was expected to take on the primary active roles within the household and community. As a woman approached menopause the pelvis changes shape, potentially as a result of shifts in hormones and could impact sexing methods used by osteologists.

This research represents the first large scale study of puberty, pregnancy and childbirth in Roman Britain. Although presented in the clinical literature and applied to evolutionary discussions on pelvis morphology (Tague, 2011; Tague, 2009), there has been no published work on obstetric hazards in Roman Britain from a bioarchaeological perspective. Previous work has relied on a historical approach, creating a discussion on obstetric hazards and female mortality from artefacts and text sources (Wells, 1975). Although commonly discussed in clinical literature dealing with obstetric hazards, this is the first study to determine the body mass and body mass index for women throughout the life course as an attempt to understand health and obstetric hazards.

The study has yielded an interesting series of results. Although primary textual sources from the period were written in Rome and based on the development of upper-class girls, the age at menarche as stated by Soranus is during the 14$^{th}$ year, which is similar to the results yielded from this study. This is far younger than other published puberty studies using the same method which tend to state menarche as occurring between 15 and 17 years. However, it is similar to modern rural and agrarian populations such as those found in India. Pelvis development also aligned with suggestions from written sources such as Rufus and Aristotle, who suggest waiting until 18 or 21 years of age to become pregnant. This would have impacted the female life course by allowing women to remain in the family home throughout their teens, and suggests a later age at marriage that typically associated with ancient societies.

Additionally, only recent publications have discussed the DOD hypothesis, which suggest that the female pelvis changes shape throughout the life course (Huseynov, et al., 2016). There are no known studies on past populations which attempt to support this theory and based on evidence from Roman Britain the DOD hypothesis shows promise. However, more studies on a wider age range are necessary.

The developmental pathology results are also interesting. Since the coccyx fuses with age, it at first seems to follow an expected pattern, with older individuals showing more than double the rate of the youngest group. However, none of the individuals should have a fused coccyx during their reproductive period. There are a number of skeletal changes including lumbarization, pubic symphysis dysplasia and hip dysplasia which were only found in the Peak Reproductive group. Among the other pathology, there is a clear split between the Pre-Peak Reproductive group and Post-Reproductive group. For example, a malformed sacral ala was the highest among the Pre-Peak Reproductive Group, lower in the Peak Group but non-existent in the Post-Peak Group. Similarly, an extreme sacral curvature was higher in the lower age groups and sacralisation peaks among the Peak-Reproductive Group and was not found among the Post-Peak group.

Although it is important to recognize that for the majority of archaeological burials it is impossible to determine if pregnancy or childbirth contributed to maternal deaths, we can see that the peak among certain pathologies in different stages of the life course may show evidence of contributing to birth hazards in past populations. In particular, the frequency of developmental pathologies of the sacrum such as a malformed sacral ala and sacralisation show a potential link between the shape of the pelvis changing due to pathologies and obstetric complications. This and similar skeletal changes should influence the first birth and if the pelvic canal is compromised in anyway this could result in an obstetric dilemma where the neonate would be unable to pass through the canal independently. Other skeletal changes were missing or were only seen in a single individual from the pre-peak reproductive group, including osteophytes in the lumbar vertebrae. This suggests that they may be linked to age and multiple pregnancies; however, this would need to be explored further.

## 8.1 Future Directions

One of the major limitations of this study is lack of obstetric data from other geographic regions both during the Roman period and after. During the Roman period it would be important to examine populations from the city of Rome as well as the provinces; also within Britain, particularly London (*Londinium*) as the largest urban site in Roman Britain, in addition to military and rural settlement sites which were not included within this study. Roman Britain

was a multicultural, with individuals from throughout the Empire living in the urban and semi-urban settlements (Leach, et al., 2010). Early archaeological, and even osteological studies, relied on grave goods as a way to determine gender or sex; however, the life course approach which incorporates physical development and sex using osteological methods, in conjunction with gendered identity as represented through grave goods and burial rites would provide an opportunity to have a better understanding of gender representations in past populations. Additionally, comparisons with Iron Age, Anglo-Saxon and later Medieval data would identify long-term trends and establish how varying levels of medical knowledge influenced birth outcomes. While parity is a popular topic among osteologists, this study did not attempt to explore parturition scars; however, it would have benefited from the ability to assess if a woman hand undergone a vaginal birth, be it successful or not. Much of the pathology and morphological changes would also benefit from published studies on known age, parity status, and if cause of death was related to childbirth.

As the DOD hypothesis is relatively unexplored and the results suggest that the pelvis does change shape as women approach perimenopause, a larger sample which included older women would be an enormous benefit, which was initially determined to be beyond the scope of this project. The additional benefit of exploring older women would be to determine signs of menopause and allow for a more complete picture of the life course. Incorporating girls younger than 10.0 would allow for the earlier stages of pubertal development to be observed as within the puberty subsample individuals as young as 10.3 years were found to be within the second stage.

Overall, an increase of bioarchaeological studies which focus on the female life course are necessary to explore topics which until recently had remained on the fringes. Access to larger samples and improved osteological methods such as sexing non-adults, signs of mental health through aDNA and peptide analysis (Stewart, et al., 2017), ancestry and further exploration of the DOD hypothesis will only increase the understanding the life course and obstetric hazards women faced in past populations.

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# APPENDIX

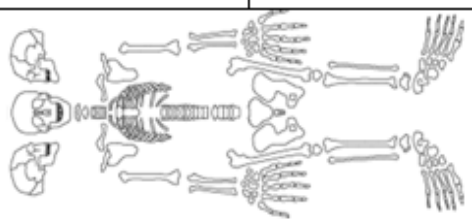
LIFE COURSE CHART

| Age Category | Mean Dental Age | Vertebral Ring Fusion | Sacral Fusion (S1-S2) | Pubic Symphysis | Auricular Surface | Social Age |
|---|---|---|---|---|---|---|
| **10-12.9** | Average 10-12.9 | | | | | *Childhood*<br>• Not Married, betrothal possible (12yrs)<br>• Established Gender Roles<br>• Beginning Active Role within family (Domestic)<br>• Passive Role within wider family and society<br>• Education |
| **13.0-15.9** | Average 13.0-15.9 | **Main: 0**<br>Possible:<br>Early- 1 | | | | *Transition to Adolescents*<br>• Legally eligible for marriage<br>• Betrothal or 1st marriage possible but rare among most social classes<br>• Prepare for menarche<br>• Established gender roles<br>• Widening active role within family<br>• Developing an active role in wider community<br>• Possible continuing education |
| **16.0-17.9** | Average 16.0-17.9 | **Main: 1**<br>Possible:<br>Early- 2<br>Late- 0 | | | | *Adolescents*<br>• Possible first Marriage<br>• Possible first pregnancy but not likely<br>• Extended education ending<br>• Recommended age for 1st child (Soranus) |

| | | | | | | |
|---|---|---|---|---|---|---|
| **18.0-19.9** | Average 18.0-19.9 | **Main: 2**<br>Possible:<br>Early- 3<br>Late- 0, 1 | **Main: 0** | | | *Transition to Adulthood*<br>• Recommended age for 1st child (Rufus)<br>• Active role in Community after marriage<br>• Earliest recommended age for pregnancy (18 years)<br>• Possible first pregnancy |
| **20.0-24.9** | M3 at $A_{1/2}$ or $A_c$ | **Main: 3**<br>Possible:<br>Late- 2 | **Main: 1**<br>Possible: 2 | **Mean Phase: 1**<br>Possible Phase 2, 3 | **Phase 1** | *Transition to Adulthood*<br>• Required by Law to be married (<20yrs)<br>• Recommended age for 1st child (Aristotle)<br>• First Marriage and child likely<br>• Shift to active role in the household of their husband's *patria potestas*.<br>• Active Role in community |
| **25.0-29.9** | | **Main: 3** | **Main: 2**<br>Possible: 3 | **Mean Phase: 2**<br>Possible Phase 3, 4, 5 | **Phase 2** | *Adulthood*<br>• Required by law to be married<br>• First Marriage and additional children likely<br>• Role of *Matrona* (Household Manager) with passing of husband's *patria potestas*.<br>• Continued Active Role in community |
| **30.0-34.9** | | | **Main: 3** | **Mean Phase: 3**<br>Possible Phase 2, 3, 4, 5 | **Phase 3** | *Adulthood*<br>• Required by Law to be married<br>• First Marriage and additional children<br>• Possible 2nd Marriage<br>• Role of *Matrona*<br>• Continued Active Role in Community<br>• Exceeded Average Life expectancy |

| | | | | | | |
|---|---|---|---|---|---|---|
| **35.0-39.9** | | | | **Mean Phase 4**<br>Possible Phase 2, 3, 4, 5 | **Phase 4** | *Adulthood*<br>• Required by Law to be married<br>• Possible second marriage and additional children<br>• Possible marriage of children, birth of grandchildren<br>• Role of *Matrona*<br>• Continued active role in community<br>• Exceeded average life expectancy |
| **40-44.9** | | | | **No Mean Phase**<br>Possible Phase 3, 4, 5, 6 | **Phase 5** | *Transition to Older Adulthood*<br>• Required by Law to be married<br>• Entering into end of Reproductive period (Menopause)<br>• Marriage of children, birth of grandchildren<br>• Role of *Matrona* and training the new wives of sons<br>• Reduction of active role within community |

# SKELETAL RECORDING FORM

| Skeleton Recording Form | | | | |
|---|---|---|---|---|
| **Summery** | | | | **Date:** |
| **Site** | **Burial #** | **Museum** | | **Period** |
| | | | | |
| **Demographic** | | | | |
| **Sex** | **Age** | **Puberty** | **Menarche** | **Pathology** |
| | | | | |
| **Burial Info** | | | | |
| **Preservation** | **Direction** | **Gravegoods** | | **Coffin/Mausoleum** |
| | | | | |
| Notes: | |  | | |

**ADULTS**

| **Sexing** | | | **Final:** |
|---|---|---|---|
| Nuchal Crest | | Ventral Arc | |
| Mastoid Process | | Subpubic Concavity | |
| Supra-Orbital Margin | | Medial Aspect | |
| Glabella/S-O Ridge | | Sacral Alae | |
| Mental Eminence | | GS Notch | |
| Gonial Angle | | | |
| **Aging** | | | |
| Pubic Symphysis | | Sacrum S1-2 | |
| Auricular Surface | | Annular Rings (T) | |
| Medial Clavicle | | Annular Rings (L) | |
| Epiphyseal fusion notes: | | | |

**NON-ADULTS**

| **Sexing** | | | **Final:** |
|---|---|---|---|
| Dental Arcade (M) | | GS Notch Angle | |
| Arch Criteria | | GS Notch Depth | |
| Gonial Angle (M) | | Trochlear shape | |
| Gonial Eversion (M) | | Trochlear symmetry | |
| | | Olecranon shape | |
| | | Medial Epicondyle | |
| | | | |
| **Aging** | | | **Final:** |
| Tooth Lengths | | Dental Ages | |
| Epiphyseal fusion notes: | | | |

## ADULTS AND NON-ADULTS

| **Puberty** | | | | **Stage:** | **Menarche:** |
|---|---|---|---|---|---|
| Canine Root | | | | Distal Radius | |
| Hamate development | | | | Proximal Ulna | |
| Proximal Phalanges | W? | C? | | Capitate of Humerus | |
| Middle Phalanges | W? | C? | | | |
| Distal Phalanges | W? | C? | | Acetabulum | |
| MC 1 | | | | Iliac Crest | |
| MC 2-5 | | | | Ischial Epiphysis | |
| **CMV:** | C2 | | C3 | C4 | |

| **Stature and Mass** | | **Side:** | |
|---|---|---|---|
| Femur Length | | Femur Head Diameter | |

| **Pelvimetry:** | | | **Classification:** | | |
|---|---|---|---|---|---|
| Fragmented | | | Articulated | | |
| | | | | | |
| Inlet: | Circumference | | Inlet: | Transverse | |
| | Brim Area | | | Conjugate | |
| | Transverse | | | Brim Area | |
| | Conjugate | | | | |
| Mid-plane: | ---------- | | Mid-plane: | Antero-posterior | |
| | | | | Lateral | |
| | | | | Mid-plane area | |
| Outlet: | ---------- | | Outlet: | Ischium Tubercles | |

| Pubic Symphysis: | Angle | Width |
|---|---|---|
| | | |

| Sacral Index: | Sacral Breadth | Sacral Height | Sacral Index |
|---|---|---|---|
| | | | |

| Brim Index: | Conjugate | Transverse | Brim Index |
|---|---|---|---|
| | | | |

## PATHOLOGY AND GENERAL NOTES

| Cribra Orbitalia: | Left | | Right | |
|---|---|---|---|---|

Photos: