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Growing Old in the Industrial Age: ageing, health, and social identity in elderly women (AD 18th-19th centuries)

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Abstract

The elderly have been neglected within bioarchaeological discourse, partly due to limitations in current osteological techniques for identifying older adults. Historical evidence suggests that older women in the 18th-19th centuries were often denigrated and neglected, but this has yet to be fully explored within bioarchaeological research. This study aims to investigate elderly underrepresentation in bioarchaeological discourse, and the biological and social impact of ageing on women in 18th-19th century England.

Archival sources were integrated with skeletal evidence from two 18th-19th century cemetery sites and a contemporaneous dataset of individuals of known age-at-death. This formed the interpretative basis for osteological case studies of two women aged 88 and 64 years at death (based on coffin plates). Older adult females from the known age-at-death sample were more frequently placed in the '18+ years' age-at-death category than males. This is partly due to preservation bias driven by factors such as osteoporosis and smaller bone size. Palaeopathological analysis revealed the impact of conditions associated with bodily degeneration in older adults, and the osteobiographies identified risks associated with reduced bone density and susceptibility to fragility fractures for ageing women. Archival cause-of-death data indicated that older women were more likely than older men to be recorded as dying of 'old age', revealing gendered social perceptions aligned to ageing.

Studies encompassing both historical and osteoarchaeological sources can further our knowledge regarding the elderly in the past, particularly those underrepresented within bioarchaeological assemblages, and reflect on persistent gendered social perceptions of these groups in the present.

Introduction

In 2016, two older adult women of known age-at-death were identified (via preserved coffin plates) within two commercial archaeological cemetery excavations: Margaret (Skeleton 36, Hazel Grove, Stockport) aged 88 years at death, and Mary (Skeleton 5.23, Cross Street, Manchester) aged 64 years at death. This presented an opportunity to explore wider themes of ageing, health, and identity in 18th-19th century England.

Old age in the UK today is broadly considered to refer to those over the age of 65 years, with those aged 85 years and above considered the 'oldest old' (ONS 2012:4; Wilson 2016:3). However, within a global perspective, an 'older person' may be considered one whose age has passed the median life expectancy for a particular region (World Health Organisation 2015:230), demonstrating the importance of discussing age and ageing within a specific population's geographic, social, and temporal context.

The process of ageing is referred to as senescence, which relates to the process of bodily deterioration with increasing age. Biological ageing brings a series of perceptible physical changes, such as the greying and/or loss of hair, wrinkling of the skin, loss of height and stooping of posture, dental decay and tooth loss (Toulalan 2015; Gowland 2007, 2017a; Appleby 2017). Other consequences of ageing include diminishing eyesight and hearing, onset of osteoporosis and osteoarthritis, weakening of the immune system and cognitive decline (Margrain and Boulton 2005; Appleby 2010, 2017). Due to the combination of sensory loss, increased imbalance, altered gait, slower protective reflexes, and underlying pathology, older people are at increased risk of falls and injury (Kenny 2005; Ambrose et al. 2013). Injuries in elderly people can take longer to heal, potentially leading to further complications and periods of sickness, which are more difficult to overcome. Those living with chronic pain and impairment can experience a loss of independence, and ultimately disempowerment, as they become increasingly reliant on family and community networks for care (Higgs and Gilleard 2016; Gowland 2017b; Sbaraini 2022).

Senescence is a variable process governed by a number of non-chronological factors relating to genetics, as well as inter-generational and socio-ecological influences (Higgs and Gilleard 2016). Not all individuals will age in the same way or according to the same timeframe (Gowland 2007; Wilson 2016), and chronic disease and functional decline may impact on the role and identity of an elderly person within society (Chase 2009; Appleby 2010, 2011; Swift et al. 2016). Social perceptions of older people have varied over time and space: they have been viewed as burdensome or with reverence, even within the same society, and subject to intersectional challenges relating to status and gender (Thane 2000; Parkin 2003; Ottaway 2004; Achenbaum 2005:21; Yallop 2013; Gowland 2007, 2017a; Appleby 2010). Perspectives of growing old are shaped by political, socio-economic, cultural and demographic factors, and determine how an individual experiences functional decline within the societal construct of old age (Achenbaum 2005:21; Gowland 2007; Higgs and Gilleard 2014). Women tend to live longer than men (Victor 2005), a pattern seen cross-culturally and throughout time. Therefore, they often represent the majority of the elderly population and will occupy this final stage of life for longer. Thus, ageing is not only a chronologically, biologically, psychologically, and socially influenced process, it is often also a strongly gendered experience, depending upon societal norms regarding masculinity and femininity (Gowland, 2006; Sofaer, 2011).

While visual cues of ageing exhibited during life (such as greying hair and wrinkled skin) are lost to the bioarchaeological record, the otherwise invisible consequences of ageing may be preserved in the skeleton, indicative of the lived experiences of older individuals within past communities. Therefore, palaeopathological analyses of older people from archaeological skeletal assemblages have the potential to provide a wealth of information regarding ageing, identity, and systems of care for this sub-group (Gowland, 2017b). However, this is limited by inherent statistical biases in age estimation methods, leading to under-ageing of older adults, as well as a host of intrinsic and extrinsic factors, which lead to inter-individual variation in the timing and expression of age-related degenerative changes (see Gowland and Chamberlain 2002, 2005; Gowland 2007, 2017a; Appleby 2010, 2011, 2017; Buckberry and Chamberlain 2002; Buckberry 2015). This has led to the standard grouping of older adults into broad open-ended age-at-death categories, such as '46+ years' (Falys and Prangle 2015).

Taphonomic factors may also lead to underrepresentation of older individuals within skeletal assemblages, and post-menopausal hormonal changes may increase the likelihood of misidentifications of sex in older females (see Walker 2005, Gowland 2007). Thus, the lived experiences of older adults, and particularly females, are often veiled within analyses of skeletal assemblages and by proxy past communities, despite the potential to directly observe the physical manifestations of ageing and associated pathologies. Recognition of this data gap in bioarchaeological research has led to modifications in statistical approaches to age estimation (Boldsen et al. 2002; Buckberry and Chamberlain 2002; Maaranen and Buckberry 2018), and the development of new methodologies (Cave and Oxenham 2016; Falys and Prangle 2015). A rich bioarchaeological discourse on old age in the past is also growing, supporting the value of context driven studies (Gowland 2007, 2016, 2017a,b; Appleby 2010, 2011, 2017; Lillehammer and Murphy 2018).

To contextualise the lived experiences of the two women of known age-at-death from the two commercial archaeological excavations, this paper will focus specifically on ageing within the context of 18th-19th century England, a period during which concern with declining urban conditions led to reports of decreased life expectancies, particularly among labouring populations (Chadwick 1842). This, alongside high infant mortality resulting in lower average life expectancy (Western and Bekvalac 2020, 179; Agarwal 2021), has led to the perception that people did not typically live to 'old age' during this period, and in other past societies (Thane 2006; Gowland 2007; Chase 2009; Schäfer 2011; Cave and Oxenham 2016; Appleby 2017). However, the 1851 census of England and Wales reveals that 4.6% of the population were over 65 years of age (830,822 individuals within a total population of 17,927,607), with more women (2.5%; 454,507 individuals) than men in this age group (2.1%; 376,315 individuals) (GB Historical GIS 2021). Therefore, those who would be considered old by modern-day Western definitions formed a respectable (albeit small) proportion of the communities in which they lived, and would have entered mortality samples upon death. While in many countries today old age is often chronologically defined for social and economic purposes (such as eligibility for state pensions), in 18th-19th century England, experiences of disease or debility, fitness for work, and appearance, were perhaps bigger driving factors as to whether an individual was considered old, reflecting the relative instability of this terminology (Ottaway 2004; Chase 2009; Yallop 2013; Higgs and Gilleard 2014; Western and Bekvalac 2020; Newman and Turner, in press).

Aims

This paper aims to explore the experiences of elderly women within 18th-19th century England, and their visibility within skeletal assemblages, via a combination of historical documentation and osteoarchaeological data. Specifically, this study investigates the extent of underrepresentation of older adult females in the 18th-19th century bioarchaeological record via osteological data from two archaeological sites (Hazel Grove, Stockport and Cross Street, Manchester), and archival data from their corresponding burial records. It uses published osteological data for individuals of known age-at-death and sex from excavations of 18^{th}-19^{th} century cemetery sites to identify potential driving factors for the relative invisibility of older adult females within skeletal assemblages. The main health challenges faced by older adult women during the 18^{th}-19^{th} centuries are explored via palaeopathological analysis from the two archaeological sites, published osteological data for individuals of known age-at-death, and cause of death data from archival (Registrar-General) sources. Ultimately, it combines the results with historical research to create osteobiographies of two older women from 18^{th}-19^{th} century Manchester.

MATERIAL AND METHODS

The sources used in this study are outlined in Table 1.

Source		Location	Date	Sample size	Map
Archival	Registrar-General[1]	London	1850	8,215	
	Cross Street burial records[2]	Manchester	1791-1840	403	
	Hazel Grove burial records[2]	Stockport (Greater Manchester)	1837-1879	82	
Osteological	Cross Street[3]	Manchester	1694-1852	173	
	Hazel Grove[3]	Stockport (Greater Manchester)	1794-1910	19	
	Known age-at-death data set[4]	London	18^{th}-19^{th} C	300	

Table 1 – List of sources used in study
[1]Total number of adults (65+ years) within the Registrar-General (1854) data for 1850. [2]Total number of adults (18+ years) within the burial records for each site. [3]Total number of adults (18+ years) within the skeletal assemblages for each site. [4]Pooled data set from four London-based sites containing named individuals – Chelsea Old Church (Cowie et al. 2008, WORD database 2022); Bow Baptist (Henderson et al. 2013); St Marylebone Paddington (Henderson et al. 2015); St Marylebone School (Miles et al. 2008), St Bride's Crypt (WORD database 2022), St Benet Sherehog (WORD database 2022)

Archaeological Sites

Excavation of the former Wesleyan Chapel in Hazel Grove, Stockport in 2016 resulted in the recovery of 39 skeletons, 19 of whom were adults (estimated to be more than 18 years of age-at-death; Newman and Holst 2016). The cemetery was in use from 1794 to 1910, with excavated burials dating from the early to mid-19th century based on five recovered coffin plates. Grave goods (e.g. a gold ring and costume jewellery beads), coffin fittings (e.g. iron loops, and coffin lace) and decorative name plates indicated that the individuals excavated are likely a mix of working- and middling class people (Newman and Holst 2016). The inhabitants of 19th century Hazel Grove were employed in a variety of trades, including the cotton and silk industries, brickworks, timber yards, glue works, the hatting trade, and nearby coal mines (Jessop and Beauchamp 2015:16).

Excavations at the site of the Unitarian Chapel on Cross Street, Manchester from 2014 to 2015 resulted in the recovery of 241 skeletons, 173 of which were adults (Keefe and Holst 2017). The burial ground was in use from 1694 to 1852, but based on coffin plates recovered during excavation these individuals likely date to the 18th to 19th centuries. With Manchester undergoing rapid population growth and transformation as a centre for woollen and textile industries during this period, the congregation was likely a mix of the working classes and *nouveau riche* families of prosperous manufacturers (Keefe and Holst 2017).

Age-at-death was estimated for adult individuals from both sites using standard ageing techniques: late fusing epiphyses (Scheuer and Black 2000), the pelvis (Brooks and Suchey 1990; Lovejoy et al. 1985), and sternal ends of the ribs (modified version of İşcan et al. 1984, 1985 and İşcan and Loth 1986 provided in Ubelaker 1989). Sex estimation was undertaken using standard techniques for the skull and pelvis (Phenice 1969; Mays and Cox 2000).

For individuals with an estimated age-at-death of 46+ years, the presence or absence of pathological changes was recorded according to recommended standard techniques (Mitchell and Brickley 2017) and the recording protocol utilised by the Museum of London/Museum of London Archaeology (Powers, 2012) to ensure compatibility with the comparative sample (see below). The pathological conditions outlined below were selected for analysis as they represent common health concerns of older individuals in the present day. Dental disease was recorded as present when an individual had one or more of the following conditions - caries, periodontal disease, periapical lesions (Hillson 2008; Ogden 2008), and/or an edentulous maxilla and/or mandible (indicative of extensive ante-mortem tooth loss). Spinal joint disease was recorded as present when degenerative changes (osteophyte formation and porosity together) were observed on either the articular facets or vertebral bodies, or when osteoarthritis (eburnation) was observed on the vertebral articular facets (Rogers and Waldron 1995; Powers 2012). Extra-spinal osteoarthritis (occurring in joints outside of the spine) was recorded as present when eburnation was evident on any joint surface (following protocol by Powers 2012, 47) for the joint complexes listed in Table 2 and 3. Presence/absence of periosteal new bone formation was recorded on the visceral surface of the ribs. This was included within the analysis due to its potential association with respiratory infections, from which older individuals are at higher risk of severe morbidity and mortality (Watson and Wilkinson 2021). Presence/absence of fractures was recorded for the skeletal regions listed in Table 2 and 3. Lastly, possible cases of metabolic conditions were noted, and were included as potential indicators of bone loss or demineralisation across the life course. Evidence of residual rickets (childhood experiences of vitamin D deficiency) and osteomalacia (vitamin D deficiency experienced in adulthood) was recorded according to Brickley and Ives (2008) and recording protocol by Powers (2012: 51-53). Osteopenia was recorded when general lightness of the bones and cortical thinning was seen, and osteoporosis only considered when this was combined with further evidence of vertebral compression fractures and/or femoral neck fractures (Powers 2012:53).

Osteobiographies were constructed for two individuals identified during the analysis as being of advanced age from biographic information from coffin plates: Margaret (Skeleton 36, Hazel Grove) and Mary (Skeleton 5.23, Cross Street). This allowed the experiences of ageing for women in 18th-19th century England to be considered on both the population and individual level.

Known age-at-death data-set

Three-hundred individuals with a known age-at-death of 18+ years were identified from London-based 18th-19th century archaeological sites via published osteological reports, and digital osteological data from the Wellcome Osteological Research Database on the Centre for Human Bioarchaeology website and from Museum of London Archaeology (MOLA) recorded sites (see Table 1 for site information). These individuals had biographical information available pertaining to age-at-death and sex, allowing for comparison of osteological age-at-death estimates with known age-at-death, and were typically from middle to higher status socio-economic backgrounds.

Presence/absence data for skeletal and dental pathology for the categories outlined above were collated from the published osteological reports and WORD database (see Powers 2012 for

Museum of London Archaeology skeletal recording methods), for those with a known age-at-death of 46+ years (N=179). Due to the availability of data, individuals from St Marylebone Paddington Street (Henderson et al. 2015) were not included in this stage of the analysis. Prevalence rates are presented for those with a known age-at-death of 46-65 years, 66+ years, and 46+ years of age-at-death overall. This is to allow observation of patterns of pathological changes in those known to be representative of older individuals (66+ years of age-at-death), but also for comparability with the two archaeological sites under study (46+ years of age-at-death).

Archival sources

Burial records for the Cross Street, Manchester and Hazel Grove, Stockport sites (see above) were used to ascertain the demographic profile of those recorded to have been interred at each site versus those excavated during archaeological interventions (see Table 1 for sample sizes). The Cross Street Burial Records (1791-1840) are available at Manchester Central Library. The Hazel Grove Burial Records (1794-1879) are located in the Stockport Heritage Library Archives, and are reported for the period 1794-1879 in Jessop and Beauchamp (2015).

Data reported by the Registrar-General (1854) for causes of death in London in 1850 were utilised to understand common health concerns experienced by older adults (65+ years) during the 18th-19th centuries, and potential gender-based differences. The report relating to 1850 was selected as this was the closest contemporaneous source available reporting the breakdown of number of individuals within each cause of death category by age. The total number of individuals with a known age-at-death of 65+ years was collated for each cause of death category, resulting in an overall sample size of 3,509 males and 4,706 females (Table 2).

Statistical Analysis

All statistical analyses were undertaken using Past 4 v.4.11 and SPSS v.27. A weighted Cohen's Kappa test was used to assess the agreement between the estimated and known age-at-death for individuals within the known age-at-death sample. This was undertaken for individuals with a discrete age-at-death estimation of 18-25, 26-35, 36-45 or 46+ years (N=271). In addition, odds ratios were calculated to investigate the likelihood of females being placed in 18+ years age-at-death categories compared to males.

A Chi-square test (or Fisher's Exact test when sample sizes were small) was used to compare frequencies of skeletal and dental pathologies between males and females for -

- those with an estimated age-at-death of 46+ years for Cross Street
- those aged 46+ years within the known age-at-death sample

Due to the very small sample size of those with an age-at-death estimate of 46+ years in Hazel Grove (N=5), statistical analysis was not undertaken for this site. A Chi-square test was also applied to explore associations between discrete causes of death and sex within the Registrar-General dataset. An alpha level of 0.05 (95% confidence level) was set. For significant outputs, standardised residuals are reported to identify frequency values that are higher or lower than expected, with a significance threshold of 2, -2.

RESULTS

Comparison of historical vs archaeological demographic profiles

Figure 1 compares demographic profiles of adults in the osteological and burial record samples from Hazel Grove and Cross Street. In the burial records, 31.7% (n=26/82) of adults interred at Hazel Grove, and 36.5% (n=147/403) at Cross Street, were aged 65+ years at death, with the oldest individuals recorded being a 96-year-old female at Cross Street and a 92-year-old female at Hazel Grove. In both the osteological and historical data there is evidence for greater risk of death in younger age groups in the Hazel Grove sample, with a higher proportion of those aged 26-45 years in the mortality samples (Fig.1a,b). This may reflect greater occupational and environmental hazards faced by the Hazel Grove population compared to Cross Street, but the small sample size of the adult osteological sample (N=19) must be acknowledged.

Those with an age-at-death estimate of 46+ years in the Hazel Grove and Cross Street burial record datasets total 56.1% (n=46/82) and 70.5% (n=284/403) of the adult samples respectively, compared to 26.3% (n=5/19) and 38.2% (n=66/173) for the respective osteological samples (Fig.1c). This cautions against direct comparisons between the two datasets, as osteological samples are rarely representative of mortality samples due to well-established biases in sampling and age-at-death estimation methods (Hoppa and Vaupel 2002). In addition, 36.8% (Hazel Grove; n=7/19) and 39.3% (Cross Street; 68/173) of the adult osteological samples were unable to be reliably assessed for age-at-death or sex due to taphonomic factors.

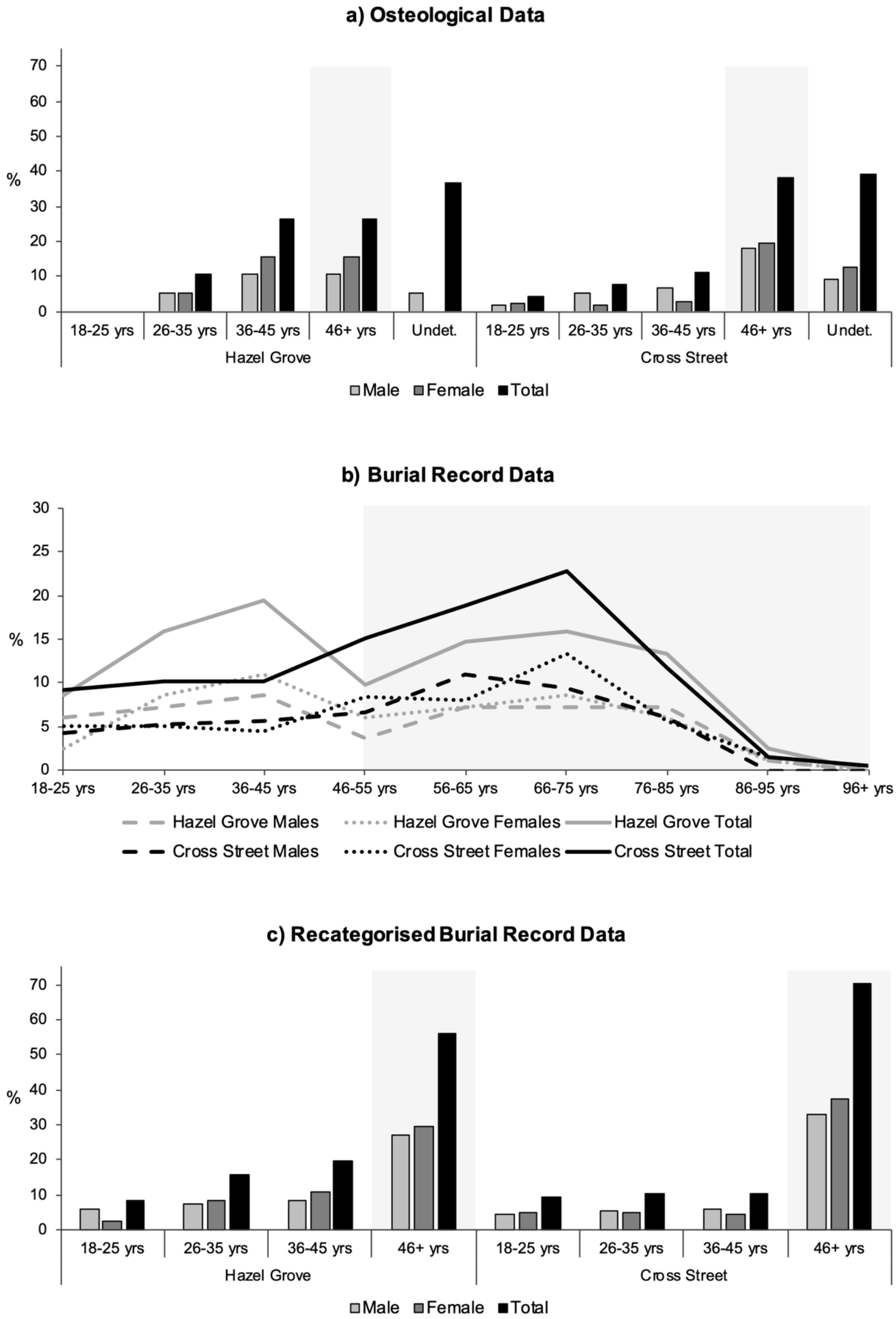


Figure 1 – Demographic data; a) age-at-death data for adult skeletons from Hazel Grove, Stockport and Cross Street, Manchester (calculated as a percentage of the total adult sample); b) age-at-death data for adults recorded in the burial records for Hazel Grove, Stockport and Cross Street, Manchester (calculated as a percentage of the total adult sample); c) recategorised age-at-death data for adults recorded in the burial samples, for comparability with osteological data. Grey areas represent individuals aged 46+ years.

Effects of preservation bias

The sample of individuals from London-based archaeological sites was used to compare osteological age-at-death estimates with known age-at-death. This revealed that 86.3% of individuals with a discrete age-at-death estimation of 18-25, 25-35, 36-45 and 46+ years (n=234/271) had been aged accurately. This was slightly higher for females (91.9%, n=114/124) than for males (81.6%, n=120/147). The weighted Cohen's kappa test revealed that there was an overall 'almost perfect' agreement between known and estimated age-at-death both for the total sample (kappa=.822, p=<.001 [95% CI, .763 to .880]) and for females (kappa=.906, p=<.001 [95% CI, .847 to .965]), and a substantial agreement for males (kappa=.749, p=<.001 [95% CI, .654 to .845]) (Watson and Petrie 2010: 1170). For those with a known age-at-death of 66+ years, 84.9% of males (n=45/53) and 68.6% (n=35/51) of females were categorised as being 'mature adults' (46+ years of age-at-death: Fig.2), with a small proportion of individuals placed into younger skeletal age-at-death categories (females = 7.8%, 4/51; males = 7.5%, 4/53).

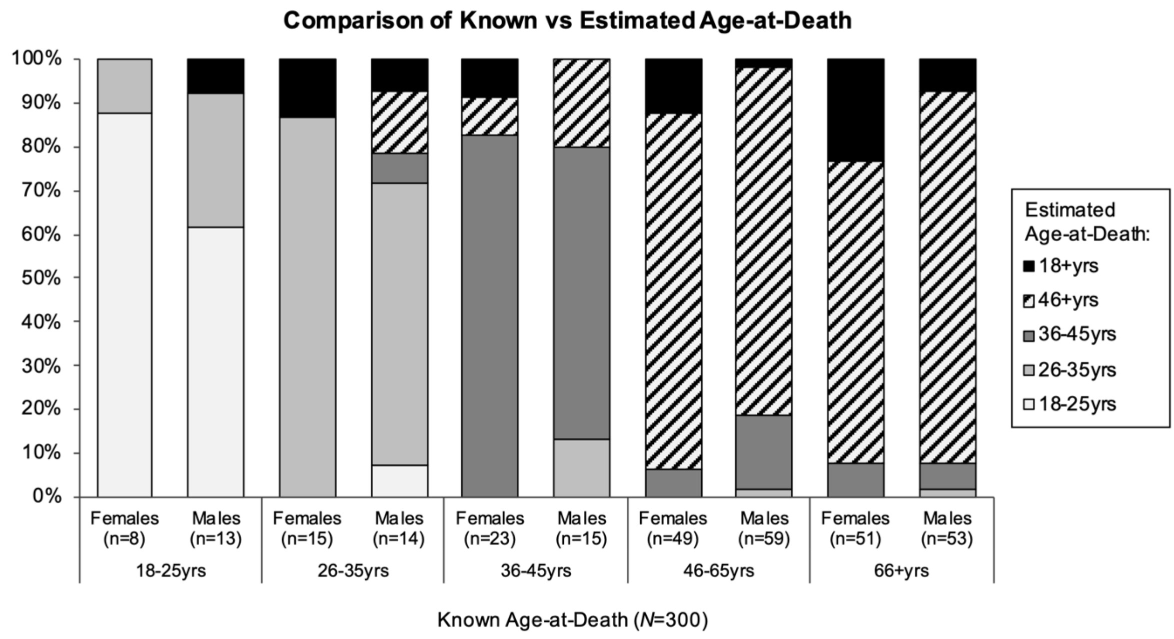


Figure 2 – Osteological age estimates for individuals aged 18+ years in sample of individuals of known age-at-death from London.

However, 15.4% (16/104) of individuals were estimated to be in the 18+ years age-at-death category, meaning a precise age-at-death estimation could not be made due to loss of skeletal elements and/or poor surface preservation. Overall, a higher proportion of females had an age-at-death estimation of 18+ years (15.1%, 22/146) than males (4.5%, 7/154), with a significantly greater odds of being placed in this age category for females compared to males (OR = 3.31, 95% CI [1.37, 8.01]). This pattern is seen across most of the adult life course (Fig.2), including those of known age-at-death of 46-65 years (females = 12.2%, 6/49; males = 1.7%, 1/59), 36-45 years (females = 8.7%, 2/23; males = 0%, 0/15) and 25-35 years (females = 13.3%, 2/15; males = 7.1%, 1/14). The exception is the 18-25-year group (females = 0%, 0/8; males = 7.7%, 1/13); however, the small sample sizes in the younger age categories must be noted.

Palaeopathological data

Table 2, Table 3 and Figure 3 show the proportion of individuals exhibiting presence/absence of dental or skeletal pathology for Hazel Grove, Cross Street, and the sample of individuals of known age-at-death from London. This was calculated as a percentage of the number of males, females, and total sample for each group. Statistical analysis could not be undertaken for Hazel Grove due to the small sample size of those with an age-at-death estimate of 46+ years (N=5).

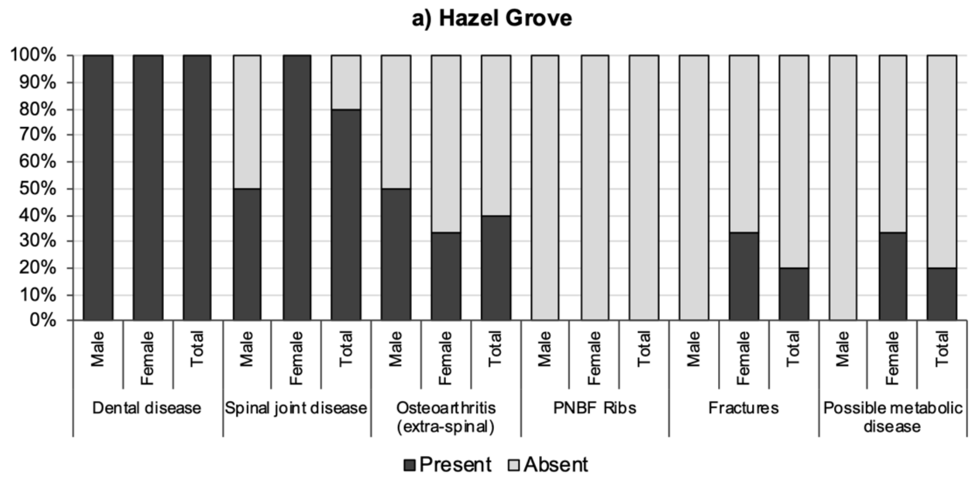
Dental disease and spinal joint disease were seen in the majority of individuals in both sites and in the known age-at-death sample (Fig.3). Individuals with some form of dental disease (dental caries, periodontal disease, periapical lesions, and/or and edentulous maxilla and/or mandible) formed 84.6% (n=55/65) of those estimated to be 46+ years of age-at-death from Cross Street, and 79.3% (n=142/179) of those aged 46+ years at death in the known age-at-death burial sample (Tables 2 and 3). This was similarly high in those aged 66+ years at death (72.6%, n=61/84). No statistically significant differences aligned to sex were identified for dental disease overall (Cross Street: $X^2(1)=2.30$, $p=0.13$; known age-at-death sample, 46+ years: $X^2(1)=0.64$, $p=.42$). There was a higher frequency of females with a known age-at-death of 66+ years with edentulous maxillae and/or mandibles (35.9%, n=14/39) compared to males (13.3%, n=6/45; Table 3). However, this higher rate of extensive ante-mortem tooth loss in females was not seen in Cross Street (Table 2). Spinal joint disease (including degenerative joint changes and/or osteoarthritis in the articular facets, and degenerative changes in the vertebral bodies) was seen in 81.5% (Cross Street; n=53/65) and 73.2% (known age-at-death sample, 46+ years; n=131/179) of individuals (Tables 2 and 3). No statistically significant differences aligned to sex were identified in the known age-at-death sample (46+ years: $X^2(1)=0.18$, $p=.67$). Higher prevalence rates of spinal joint disease were seen in those known

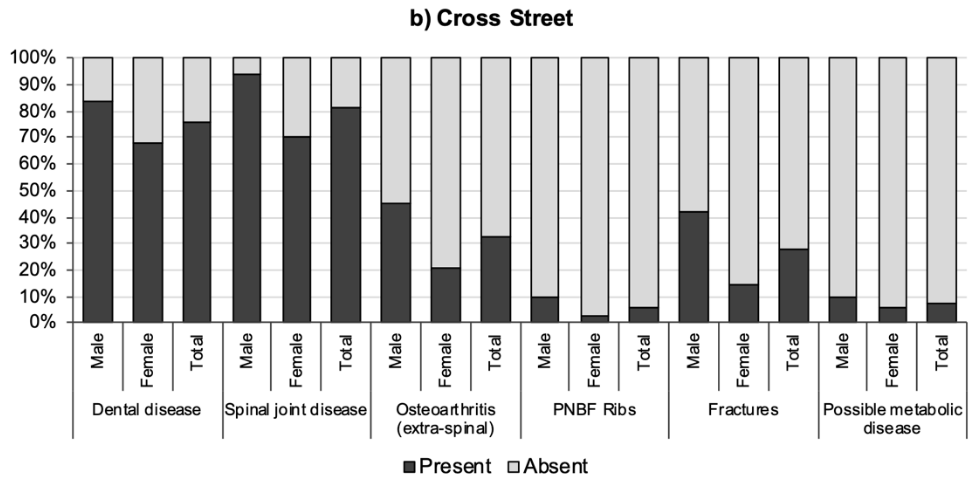
Archaeological sites – 46+ years		Hazel Grove						Cross Street					
		Males (N=2)		Females (N=3)		Total (N=5)		Males (N=31)		Females (N=34)		Total (N=65)	
		n	%	n	%	n	%	n	%	n	%	n	%
Dental disease	**Overall**	**2**	**100.00**	**3**	**100.00**	**5**	**100.00**	**26**	**83.87**	**23**	**67.65**	**49**	**75.38**
	Caries	1	50.00	2	66.67	3	60.00	22	70.97	16	47.06	38	58.46
	Periodontal disease	2	100.00	1	33.33	3	60.00	21	67.74	11	32.35	32	49.23
	Periapical lesions	0	-	2	66.67	2	40.00	14	45.16	9	26.47	23	35.38
	Edentulous (max/mand/both)	0	-	1	33.33	1	20.00	1	3.23	1	2.94	2	3.08
Spinal joint disease		1	50.00	3	100.00	4	80.00	29	93.55	24	70.59	53	81.54
Extra-spinal OA	**Overall**	**1**	**50.00**	**1**	**33.33**	**2**	**40.00**	**14**	**45.16**	**7**	**20.59**	**21**	**32.31**
	Shoulder	0	-	0	-	0	-	2	6.45	0	-	2	3.08
	Elbow	1	50.00	1	33.33	2	40.00	0	-	1	2.94	1	1.54
	Wrist	0	-	1	33.33	1	20.00	4	12.90	4	11.76	8	12.31
	Hand	0	-	1	33.33	1	20.00	6	19.35	6	17.65	12	18.46
	Hip	0	-	1	33.33	1	20.00	1	3.23	3	8.82	4	6.15
	Knee	0	-	1	33.33	1	20.00	3	9.68	2	5.88	5	7.69
	Ankle	0	-	0	-	0	-	0	0.00	0	0.00	0	-
	Foot	0	-	1	33.33	1	20.00	7	22.58	2	5.88	9	13.85
NBF Ribs		**0**	**-**	**0**	**-**	**0**	**-**	**3**	**9.68**	**1**	**2.94**	**4**	**6.15**
Fractures	**Overall**	**0**	**-**	**1**	**33.33**	**1**	**20.00**	**13**	**41.94**	**5**	**14.71**	**18**	**27.69**
	Skull	0	-	1	33.33	1	20.00	0	-	1	2.94	1	1.54
	Spinal	0	-	1	33.33	1	20.00	8	25.81	2	5.88	10	15.38
	Ribs	0	-	1	33.33	1	20.00	5	16.13	0	-	5	7.69
	Shoulder	0	-	1	33.33	1	20.00	1	3.23	1	2.94	2	3.08
	Upper limb	0	-	0	-	0	-	0	-	0	-	0	-
	Hand	0	-	0	-	0	-	0	-	0	-	0	-
	Pelvis + sacrum	0	-	0	-	0	-	0	-	0	-	0	-
	Lower limb	0	-	0	-	0	-	1	3.23	1	2.94	2	3.08
	Foot	0	-	0	-	0	-	0	-	0	-	0	-
Possible metabolic disease	**Overall**	**0**	**-**	**1**	**33.33**	**1**	**20.00**	**3**	**9.68**	**2**	**5.88**	**5**	**7.69**
	Residual rickets	0	-	0	-	0	-	3	9.68	2	5.88	5	7.69
	Osteomalacia	0	-	1	33.33	1	20.00	0	-	0	-	0	-
	Osteopenia/ osteoporosis	0	-	1	33.33	1	20.00	0	-	1	2.94	1	1.54

Table 2 – Palaeopathological data for individuals with an age-at-death of 46+ years in Hazel Grove and Cross Street. Percentage calculated from total number of males, females, and combined respectively. OA = osteoarthritis, NBF = new bone formation.

Known age-at-death sample		46-65 years						66+ years						46+ years					
		Male (N=51)		Female (N=44)		Total (N=95)		Male (N=45)		Female (N=39)		Total (N=84)		Male (N=96)		Female (N=83)		Total (N=179)	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Dental disease	**Overall**	43	84.31	38	86.36	81	85.26	31	68.89	30	76.92	61	72.62	74	77.08	68	81.93	142	79.33
	Caries	28	54.90	32	72.73	60	63.16	13	28.89	13	33.33	26	30.95	41	42.71	45	54.22	86	48.04
	Periodontal disease	37	72.55	36	81.82	73	76.84	23	51.11	19	48.72	42	50.00	60	62.50	55	66.27	115	64.25
	Periapical lesions	23	45.10	17	38.64	40	42.11	12	26.67	8	20.51	20	23.81	35	36.46	25	30.12	60	33.52
	Edentulous (max/mand/both)	3	5.88	2	4.55	5	5.26	6	13.33	14	35.90	20	23.81	9	9.38	16	19.28	25	13.97
Spinal joint disease		33	64.71	28	63.64	61	64.21	36	80.00	34	87.18	70	83.33	69	71.88	62	74.70	131	73.18
Extra-spinal OA	**Overall**	16	31.37	14	31.82	30	31.58	27	60.00	25	64.10	52	61.90	43	44.79	39	46.99	82	45.81
	Shoulder	10	19.61	4	9.09	14	14.74	12	26.67	10	25.64	22	26.19	22	22.92	14	16.87	36	20.11
	Elbow	1	1.96	0	-	1	1.05	2	4.44	4	10.26	6	7.14	3	3.13	4	4.82	7	3.91
	Wrist	2	3.92	0	-	2	2.11	7	15.56	5	12.82	12	14.29	9	9.38	5	6.02	14	7.82
	Hand	2	3.92	2	4.55	4	4.21	11	24.44	12	30.77	23	27.38	13	13.54	14	16.87	27	15.08
	Hip	1	1.96	1	2.27	2	2.11	3	6.67	2	5.13	5	5.95	4	4.17	3	3.61	7	3.91
	Knee	1	1.96	4	9.09	5	5.26	2	4.44	8	20.51	10	11.90	3	3.13	12	14.46	15	8.38
	Ankle	0	-	0	-	0	-	0	-	1	2.56	1	1.19	0	-	1	1.20	1	0.56
	Foot	7	13.73	6	13.64	13	13.68	6	13.33	7	17.95	13	15.48	13	13.54	13	15.66	26	14.53
NBF Ribs		3	5.88	1	2.27	4	4.21	3	6.67	1	2.56	4	4.76	6	6.25	2	2.41	8	4.47
Fractures	**Overall**	14	27.45	4	9.09	18	18.95	16	35.56	14	35.90	30	35.71	30	31.25	18	21.69	48	26.82
	Skull	3	5.88	0	-	3	3.16	2	4.44	0	-	2	2.38	5	5.21	0	-	5	2.79
	Spinal	6	11.76	1	2.27	7	7.37	5	11.11	4	10.26	9	10.71	11	11.46	5	6.02	16	8.94
	Ribs	4	7.84	3	6.82	7	7.37	5	11.11	2	5.13	7	8.33	9	9.38	5	6.02	14	7.82
	Shoulder	0	-	0	-	0	-	1	2.22	0	-	1	1.19	1	1.04	0	-	1	0.56
	Upper limb	3	5.88	0	-	3	3.16	1	2.22	7	17.95	8	9.52	4	4.17	7	8.43	11	6.15
	Hand	0	-	0	-	0	-	1	2.22	1	2.56	2	2.38	1	1.04	1	1.20	2	1.12
	Pelvis + sacrum	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
	Lower limb	1	1.96	0	-	1	1.05	2	4.44	2	5.13	4	4.76	3	3.13	2	2.41	5	2.79
	Foot	2	3.92	0	-	2	2.11	1	2.22	0	-	1	1.19	3	3.13	0	-	3	1.68
Possible metabolic disease	**Overall**	2	3.92	3	6.82	5	5.26	5	11.11	10	25.64	15	17.86	7	7.29	13	15.66	20	11.17
	Residual rickets	2	3.92	2	4.55	4	4.21	5	11.11	3	7.69	8	9.52	7	7.29	5	6.02	12	6.70
	Osteomalacia	0	-	0	-	0	-	2	4.44	1	2.56	3	3.57	2	2.08	1	1.20	3	1.68
	Osteopenia/ osteoporosis	0	-	1	2.27	1	1.05	0	-	8	20.51	8	9.52	0	-	9	10.84	9	5.03

Table 3 – Palaeopathological data for individuals aged 46-65 years, 66+ years, and 46+ years at death in the known age-at-death sample from London. Percentage calculated from total number of males, females, and combined respectively. OA = osteoarthritis, NBF = new bone formation.





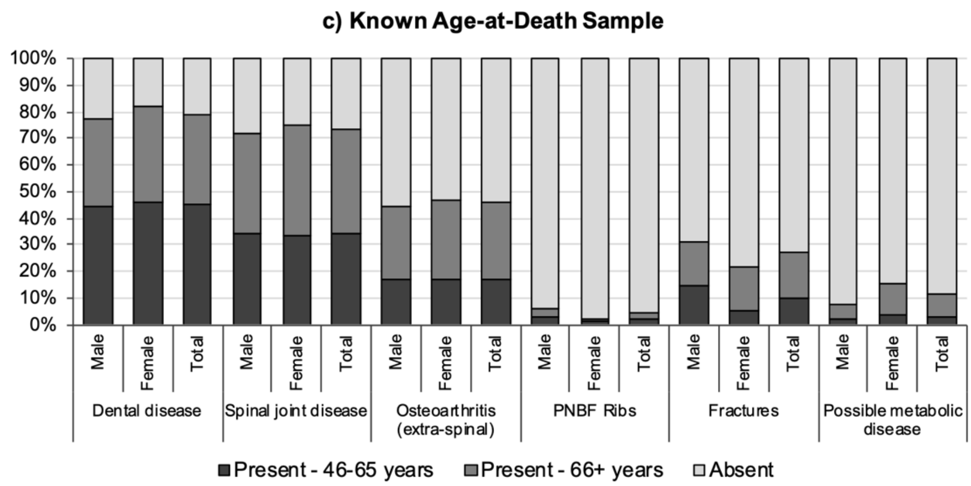


Figure 3 – Prevalence of pathology for a) adults aged 46+ years in Hazel Grove (calculated as a percentage of total males, total females, and total sample for this age category), b) adults aged 46+ years in Cross Street (calculated as a percentage of total males, total females, and total sample for this age category), and c) adults aged 46-65 years and 66+ years in the known age-at-death sample from London (calculated as a percentage of total males, total females, and total sample for this age category).

to be aged 66+ years at death (Table 3). A significant association between sex and presence of spinal joint disease was identified at Cross Street ($X^2(1)=5.68$, $p=.02$), likely due to the higher frequency in males (93.6%, n=29/31) compared to females (70.6%, n=24/34). However, males did not have significantly more cases of spinal joint disease than expected (z=0.74).

Extra-spinal osteoarthritis (recorded only when eburnation was present, see above) was seen in 32.3% (n=21/65) of the Cross Street sample, and 45.8% (n=82/179) of those aged 46+ years and 61.9% (n=52/84) of those 66+ years in the known age-at-death sample (Fig.3). No statistically significant differences aligned to sex were identified in those aged 46+ years in the known age-at-death sample ($X^2(1)=0.09$, $p=.77$). A statistically significant association between sex and presence of extra-spinal osteoarthritis was identified at Cross Street ($X^2(1)=4.48$, $p=.03$), again likely due to a higher frequency in males (45.2%, n=14/31) compared to females (20.6%, n=7/34: Fig.3). However, males did not have significantly more cases of extra-spinal joint disease than expected (z=1.3). In Cross Street, osteoarthritis was most commonly seen in the wrist (12.9%), hand (19.4%) and foot (22.6%) for males, and in the wrist (11.8%) and hand (17.7%) for females (Table 2). In the known age-at-death sample for those aged 46+ years, it was most common in the shoulder (22.9%), hand (13.5%), and foot (13.5%) for males, and the shoulder (16.9%), hand (16.9%), knee (14.5%), and foot (15.7%) for females (Table 3). For those known to be aged 66+ years at death frequency rates of osteoarthritis were generally higher, and were most common in the shoulder (26.7%), wrist (15.6%), hand (24.4%) and foot (13.3%) in males, and in the shoulder (25.6%), elbow (10.3%), wrist (12.8%), hand (30.8%), knee (20.5%), and foot (18.0%) for females (Table 3, Fig.3).

A low proportion of individuals had evidence of new bone formation on the visceral surfaces of the ribs in both sites and in the known age-at-death sample (Fig.3), and no statistically significant sex differences were identified (Cross Street: 4/65; $p=0.34$, Fisher's Exact test; known age-at-death sample, 46+ years: 8/179; $p=29$, Fisher's Exact test).

Fractures were recorded in 27.7% (n=18/65) of the Cross Street sample, and 26.8% (n=48/179) of those aged 46+ years and 35.7% (n=30/84) of those 66+ years in the known age-at-death sample (Fig.3). Sex was found to be statistically significantly associated with frequency of fractures in the Cross Street sample ($X^2(1)=6.00$, $p=.01$), with a higher prevalence seen in males (41.9%, n=13/31) compared to females (14.7%, n=5/34). However, the frequency of fractures was not significantly higher than expected for males (z=1.5). For Cross Street, fractures were most frequently seen in the spine (25.8%) and ribs (16.1%) for males (Table 2). There were no statistically significant associations between sex and prevalence of fracture in the known age-at-death sample (46+ years: $X^2(1)=2.07$, $p=.15$), but males aged 46-65 years at death had a higher rate of fractures (27.5%, n=14/51) compared to females (9.1%, n=4/44; Table 3 and Fig.3). Prevalence rates of fractures were more equal for those aged 66+ years at death (Table 3, Fig.3). For those known to be aged 46+ years at death, fractures were most frequently seen in the spine (11.5%) for males, and the upper limb (8.4%) for females (Table 3). For those aged 66+ years at death, they were seen most frequently in the spine (11.1%) and ribs (11.1%) for males, and the spine (10.3%) and upper limb (18%) for females.

Possible instances of metabolic disease (including residual rickets, osteomalacia and/or osteopenia/osteoporosis) were seen in 7.7% (n=5/65) of individuals estimated to be 46+ years from Cross Street, and 11.2% (n=20/179) of individuals aged 46+ years within the known age-at-death sample. Potential evidence of osteoporosis was seen in only one individual from Hazel Grove and one individual from Cross Street (both females), possibly due to the difficulty of diagnosing this condition without the use of radiography (Brickley and Ives 2008). Presence of possible osteoporosis/osteopenia was noted in the WORD database for nine individuals (all females; in accordance with Powers 2012:53) within the known age-at-death sample (Table 3). The majority of these were aged 66+ years at death (9.5%, 8/84).

Cause of death data

Cause of death for those who died aged 65+ years in London in 1850 was assessed for males (n = 3,509) and females (n = 4,706) (Table 2). Conditions of the nervous system (10.4%, n=858/8215), cardiovascular system (12.3%, n=1012/8215), and the respiratory system (21.0%, n=1722/8215) were the most commonly given causes of death of both males and females aged 65+ years (see Table 4).

Analysis of sex differentials in the data revealed statistically significant differences in documented cause of death between males and females ($X^2(19)=291.70$, $p=<.001$). Fewer males than expected died due to dropsy (z=-2.1), cancer (z=-2.9), conditions of the digestive system (z=-2.2), and conditions of the reproductive system (z=-2.6). However, more males than expected died due to gout (z=2.1), tubercular diseases (z=4.1), conditions of the

Table 4 – Cause of death of those aged 65+ years in London in 1850 (Registrar-General, 1854). Percentage calculated from total number of males, females, and combined respectively. Categories with over 10% of individuals affected highlighted.

Cause of Death		Registrar-General (1850)					
		Males		Females		Combined	
Infectious disease	*Smallpox, measles, scarlatina, whooping cough, thrush, diarrhoea, dysentery, cholera, influenza, ague, remittent fever, typhus, rheumatic fever, erysipelas, syphilis*	246	7.01%	378	8.03%	624	7.60%
Haemorrhage	-	20	0.57%	14	0.30%	34	0.41%
Dropsy	-	100	2.85%	189	4.02%	289	3.52%
Sepsis	*Mortification*	41	1.17%	53	1.13%	94	1.14%
Cancer	-	60	1.71%	143	3.04%	203	2.47%
Gout	-	17	0.48%	7	0.15%	24	0.29%
Tubercular diseases	*Scrofula, tabes mesenterica, phthisis (consumption), hydrocephalus*	126	3.59%	79	1.68%	205	2.50%
Nervous system	*Cephalitis, paralysis, chorea, epilepsy, tetanus, insanity, convulsions, disease of the brain*	357	**10.17%**	501	**10.65%**	858	**10.44%**
Cardiovascular system	*Apoplexy, pericarditis, aneurism, disease of the heart*	488	**13.91%**	524	**11.13%**	1012	**12.32%**
Respiratory system	*Laryngitis, bronchitis, pleurisy, pneumonia, asthma, disease of the lungs*	775	**22.09%**	947	**20.12%**	1722	**20.96%**
Digestive system	*Quinsey, gastritis, enteritis, peritonitis, ascites, ulceration of intestines, hernia, ileus, intussusception, stricture of the intestinal canal, disease of stomach, disease of pancreas, hepatitis, jaundice, disease of liver, disease of spleen*	150	4.27%	270	5.74%	420	5.11%
Urinary system	*Nephritis, Bright's disease, ischuria, diabetes, stone, cystitis, stricture of the urethra, disease of kidneys*	143	4.08%	36	0.76%	179	2.18%
Reproductive system	*Ovarian dropsy, disease of the uterus*	3	0.09%	25	0.53%	28	0.34%
Joint disease	*Arthritis, rheumatism, disease of the joints*	22	0.63%	29	0.62%	51	0.62%
Skin disease	*Carbuncle, phlegmon, disease of skin*	10	0.28%	4	0.08%	14	0.17%
Atrophy	-	46	1.31%	16	0.34%	62	0.75%
Old age	-	728	**20.75%**	1331	**28.28%**	2059	**25.06%**
Sudden	-	71	2.02%	71	1.51%	142	1.73%
Fractures/contusions/ wounds	-	69	1.97%	55	1.17%	124	1.51%
Neglect/traumatic/ violent	*Privation of food, neglect, cold, poison, burns and scalds, hanging and suffocation, drowning, other violence*	31	0.88%	32	0.68%	63	0.77%
Not specified	-	6	0.17%	2	0.04%	8	0.10%
Total		**3509**		**4706**		**8215**	

cardiovascular system (z=2.7), conditions of the urinary system (z=7.6), atrophy (z=3.8), and fractures/contusions/wounds (z=2.2). In comparison, fewer females than expected died due to tubercular diseases (z=-3.6), conditions of the cardiovascular system (-2.3), conditions of the urinary system (z=-6.6), and atrophy (z=-3.3), while more females than expected died due to cancer (z=2.5) and conditions of the reproductive system (z=2.2).

A quarter (25.1%) of individuals were recorded as dying of 'old age' (Table 4). Despite there being a high proportion of both sexes recorded as dying from old age, significantly fewer males died of this cause than expected (z=-5.1), and significantly more females (z=4.4). The proportion of individuals dying of old age started from 55-64 years (2.4%: 101/4267) and increased with advancing age: 65-74 years (12.9%: 573/4432), 75-84 years (34.2%: 1023/2992), 85-94 years (57.5%: 420/730) and 95+ years (70.5%: 43/61). An increasing bias in the overall number of females within each advancing age category compared to males is noted (55-64 years = 51.0%; 65-74 years = 53.9%; 75-84 years = 60.0%; 85-94 years = 65.1%; 95+ years = 77.0%), which is likely a factor in the higher number of females reported to have died of old age compared to males.

Osteological analysis: Margaret (Skeleton 36, Hazel Grove) and Mary (Skeleton 5.23, Cross Street)

The detailed osteological analysis of the two older women of known age-at-death from Hazel Grove, Stockport and Cross Street, Manchester is reported below. Margaret (Skeleton 36, Hazel Grove) died aged 88 years in 1832, based on her partially preserved coffin plate. Her skeleton was well preserved, with 90+% completeness (Fig.4), and her age-at-death estimate via osteological analysis was 46+ years (Newman and Holst 2016). Mary (Skeleton 5.23, Cross Street) was aged 64 years of age at the time of her death in 1809. Approximately 50% of her skeleton was preserved for analysis, which produced an age-at-death estimation of 18+ years (Keefe and Holst 2017). Due to the preservation of her whole name on the coffin plate, cause of death documentation could be identified, which was recorded as 'decline'. Both women presented a suite of skeletal pathological changes that may have been related to the ageing process (Table 5).

Margaret (Skeleton 36, Hazel Grove) was edentulous, and Mary (Skeleton 5.23, Cross Street) had lost at least 21 of her teeth during life. While the joint surfaces in Mary's skeleton (Skeleton

5.23, Cross Street) were too poorly preserved to assess joint disease, degenerative joint changes were seen throughout Margaret's skeleton (Skeleton 36, Hazel Grove: Table 5). Osteoarthritis was noted throughout the vertebral column (leading to fusion of C3 and C4, and T3-T5), in the right distal radioulnar joint, the right knee, and bilaterally in the joints of the elbow, wrists, hips, and the proximal end of the first metatarsal.

Pathological Change	Hazel Grove Skeleton 36 (88 years of age)	Cross Street Skeleton 5.23 (64 years of age)
Age related changes		
Osteoporosis[1,2]	Possible	Possible
Osteoarthritis[3]	Elbows, wrist, hips, knees, feet, spine	Few joint surfaces preserved
Extensive ante-mortem tooth loss[4]	✓	✓
Rib fractures[5,6]	✓	✓
Hip fractures[7]	✗	✗
Pressure sores (decubiti)[8]	✓	✗
Compression fractures of vertebrae[9]	✓	✗
Forearm fractures[10]	✗	Ulnae
Other less common fragility fractures (clavicle, sternum, scapulae, lower leg)[11]	Sternum	Clavicles
Indicators of elder abuse		
Multiple fractures at varying stages of healing[12]	✓	✓
Fractured teeth and facial bones[12]	✗	✗
Blunt or sharp force trauma to cranium[12]	✓	✗
Pressure sores (decubiti)[12]	✓	✗
Multiple rib fractures[12]	✓	✓
Fractures in thorax region[12]	Scapulae, sternum	Clavicles, scapulae
Defensive injuries on arms and legs[12]	✗	Ulnae

Table 5 – Summary of pathological changes which may be associated with the normal ageing process, and elder abuse, in the two case studies. *References: Brickley and Ives (2008)[1], Ortner (2003)[2], Anderson and Loeser (2010)[3], Pietschmann et al. (2009)[4], Beck et al. (2010)[5], Roberts and Manchester (2005)[6], Carpintaro et al. (2014)[7], DiMaio and DiMaio (2001)[8], Amin et al. (2014)[9], Tang and Kumar (2011)[10], Jackuliak and Juraj (2014)[11], Gowland (2016)[12]*

Margaret (Skeleton 36, Hazel Grove) had osteitis of the left tibia, leading to extensive new bone formation and swelling of the tibial shaft (Fig.4f). Layers of woven bone and remodelling lamellar bone were suggestive of a recurrent infection. Circular areas of newer bone formation along the medial surface may relate to overlying lesions or skin ulcers. Osteitis also affected the distal half of the right fibula shaft. Radiographic analysis confirmed that neither bone had been fractured. A highly erosive lesion (20mm by 7mm) was present on the lateral surface of the right femoral midshaft (Fig.4e), and an area of thick and porotic new bone formation on the lateral proximal third of the left femur shaft overlay a larger patch of lamellar bone, suggesting a site of recurrent infection.

Both individuals demonstrated a patterning of healed, healing, and unhealed fractures suggestive of the influence of underlying pathology (Table 5). Mary (Skeleton 5.23, Cross Street) had bilateral transverse clavicle fractures which were in the very early stages of healing, and bilateral pseudofractures on the proximal shafts of her ulnae (Keefe and Holst 2017). The ulnar fractures were evident as cracks on the anterior surface of the shafts, with a buckled appearance at the fracture margins, and appeared to be in the process of healing (Keefe and Holst 2017). Additional pseudofractures were seen at the base of the acromion process of both scapulae, and on the necks of four upper ribs (three right and one left), at different stages of healing. Margaret (Skeleton 36, Hazel Grove) also presented unhealed and healing bilateral scapular fractures on the lateral borders (Fig.4b), the base of the acromion processes, and the neck of the right scapula. A well-healed fracture callus was seen on the lateral border of the left scapula. Additionally, she had an exceptional number of rib fractures, with a minimum of 42 fracture sites evident (20 on the left side, and 22 on the right side). Every rib present had at least one fracture, with many fractured in multiple places in varying stages of healing. Many were concentrated on the head and neck regions of the ribs, particularly those in the earlier stages of healing. However, the entirety of the rib cage was affected (Fig.4d). A partially healed fracture was also seen on the body of the sternum (Fig.4c).

Margaret (Skeleton 36, Hazel Grove) had numerous well-healed depressions on the cranial vault. Two were located on the frontal bone, at least six on the parietal bones and two on the occipital bone. The indentations had smooth borders and were generally circular or ovoid in shape, with the exception of a triangular arrangement of linear indentations on the right parietal bone (Fig.4a). Due to the well-healed nature of these indentations, it is unlikely that these

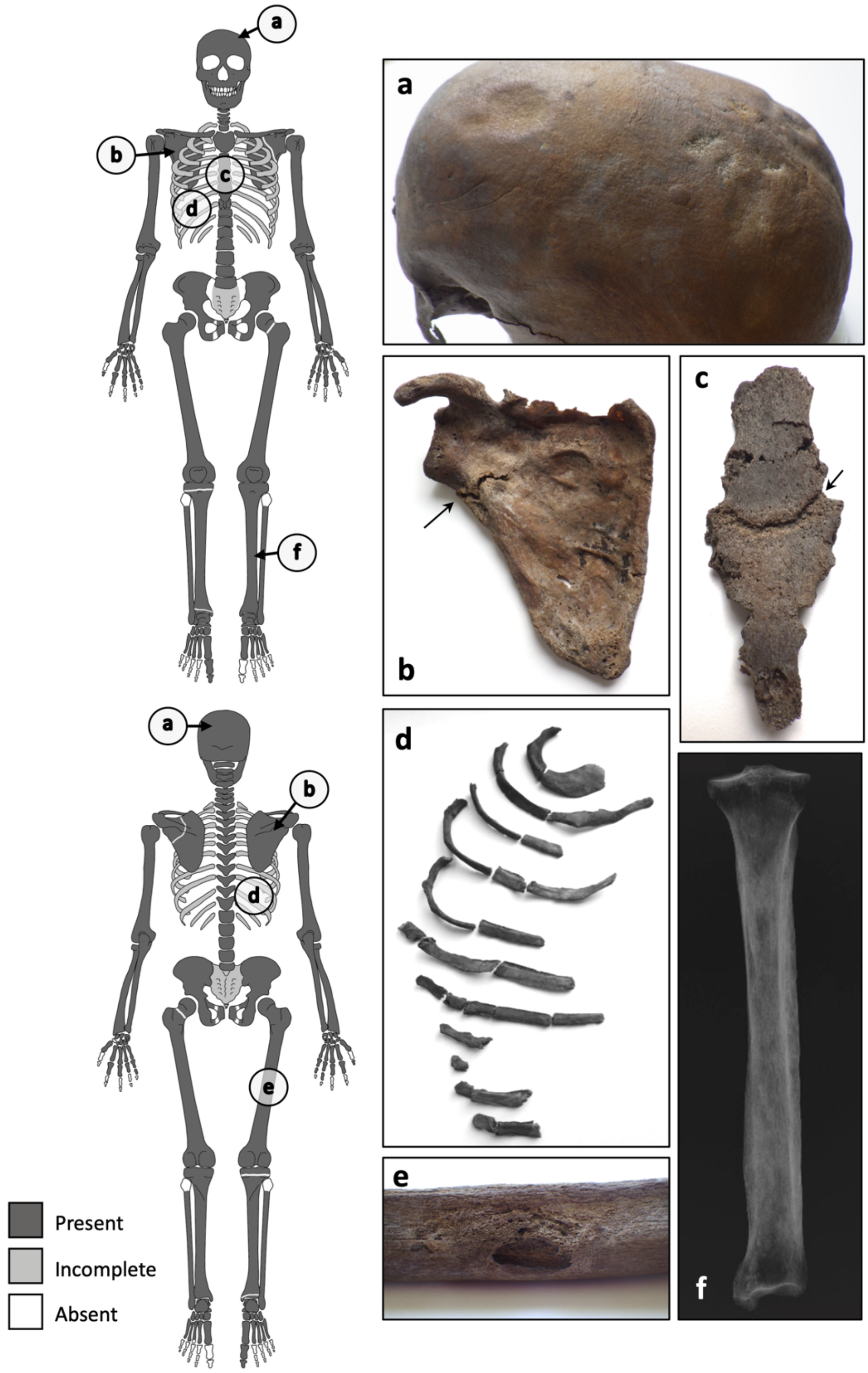


Figure 4 – Distribution of the pathological changes seen on Skeleton 36, Hazel Grove, Stockport; a) multiple indentations seen on the frontal and parietal bones, possible healed cranial trauma; b) healing fracture to the lateral border of the right scapula; c) possible healing fracture to the sternum; d) right side of the rib cage, demonstrating location of multiple fractures in different stages of healing; e) erosive lesion and associated new bone formation on the lateral surface of the right femoral midshaft; f) antero-posterior radiograph of the left tibia demonstrating extensive new bone formation.

represent erosive lesions stemming from infectious disease and are therefore more likely to be the result of trauma.

DISCUSSION

In the 18th-19th centuries in England people were broadly thought to enter old age around 60 to 65 years of age (Thane 2000; Ottaway 2004). However, defining concepts of age and ageing in both past and present-day society solely via chronologically defined boundaries is not clear-cut (Covey 1992; Higgs and Gilleard 2014, 2016; Sbaraini 2022).

Disparities were identified between representation of older individuals in demographic profiles from the burial records and archaeological assemblages from Cross Street, Manchester and Hazel Grove, Stockport. Older adult skeletons are frequently categorised as 46+ or 50+ years of age-at-death, but a range of categorical variations have been noted (see Falys and Lewis 2011). As highlighted in grey in Figure 1, this broad grouping obscures data regarding representation of those aged 65+ years at death in mortality samples. This led to an appreciable loss of nuanced data on age structure and breadth of lifespan based on osteological data alone. This is demonstrated by the categorisation of Margaret (Skeleton 36, Hazel Grove) as 46+ years of age-at-death based on skeletal analysis, despite her known age-at-death of 88 years. While aforementioned limitations in standard age-at-death estimation methods for adults do impact on ability to identify individuals from older demographics, as has previously been recognised (Walker 1995; Gowland 2007), there are multiple driving factors in the underrepresentation of older adults in the bioarchaeological record, including preservation bias.

Analysis of the known age-at-death sample from London revealed that while age-at-death estimates are generally accurate when compared to known age (as also seen in DeWitte et al 2016), particularly for females, those aged over 66+ years are frequently placed in the '18+ years' category. This was due to poor preservation of skeletal elements required for age-at-death estimation, and was more likely to impact females than males. It was also seen in the analysis of Mary (Skeleton 5.23, Cross Street, albeit at 64 years of age-at-death), who would not have been identified as an older female if not for her coffin plate. This preservation bias has previously been highlighted by Walker (1995), who found that a disproportionate number of older females within the St Bride's Church crypt assemblage were placed within an undetermined sex category due to poor preservation. This was attributed to the effects of post-menopausal bone loss. Older individuals are susceptible to loss of bone mass with increasing age, the extent of which is influenced by intrinsic factors (including genetics, peak bone mass, and hormonal status) and extrinsic factors (including nutrition, tobacco usage, physical activity, and comorbidities) (Demontiero et al. 2012:41; Agarwal 2012; Western and Bekvalac 2020, 198; Agarwal 2021). For women in the UK today, menopause typically commences from approximately 45-55 years of age and significantly increases bone resorption due to declining levels of oestrogen (Demontiero et al. 2012). Thus, while both men and women are at risk of bone loss and associated morbidity and mortality from osteoporosis-related fractures, this often disproportionately affects women (Agarwal 2021). However, patterns in bone loss, particularly in relation to biological sex and advancing age, are not static and have been found to vary over time and space in past populations (Agarwal, 2012; Agarwal 2021). A large-scale study of osteoporosis via second metacarpal radiogrammetry found that during the industrial period (1750-1900) the highest rates of osteoporosis were seen in older adults generally, but particularly in older females (Western and Bekvalac 2020, 202). However, bone loss was also seen in younger females and males (albeit to a lesser degree) in the industrial period, and significantly higher rates of bone loss in younger female and male adults were seen in pre-industrial populations likely associated with poor nutrition (Western and Bekvalac 2020, 202). Thus, the accumulation of cultural and environmental factors experienced across the life course, and their influence on peak bone mass and bone quality, must also be considered when assessing patterns in bone loss aligned to sex and gender (Agarwal 2012; Agarwal 2021). For example, working-class women in 18th-19th century England were more likely to prioritise allocation of food resources within the family to bread-winners, frequently leading to their own malnourishment (Horrell and Oxley 2012), which may have posed an additional risk factor for osteoporosis later in life. Indeed, any skeletal condition resulting in reduced bone density can potentially influence preservation within burial samples, including vitamin D deficiency (Brickley and Buckberry 2015). While only a small proportion of individuals within the study sample (see Table 2 and Table 3) had evidence of residual rickets and possible osteomalacia, skeletal manifestation of these conditions is considered to be indicative of a wider population prevalence of vitamin D deficiency (Snoddy et al 2016). Thus, sex differences aligned to sex and gender, socioeconomic factors, and potential co-morbidities, may predispose older females to loss or misrepresentation within burial samples, which may in turn reduce their visibility as a group within skeletal assemblages.

The ageing body and social identity in the 18th-19th century England

The experiences of ageing for women in 18th-19th century England are further considered on both an individual and population level via the integration of the palaeopathological data with the detailed osteological analysis of Margaret (Skeleton 36, Hazel Grove: 88 years of age-at-death) and Mary (Skeleton 5.23, Cross Street: 64 years of age-at-death).

Palaeopathological analysis revealed that spinal degeneration, extra-spinal osteoarthritis, and dental diseases were experienced by a large proportion of individuals estimated as aged 46+ years at death in the Hazel Grove and Cross Street samples, and of known age-at-death of 46+ years and 66+ years within the sample from London. Due to the accumulation of risk factors (such as dietary influences, oral hygiene practices, and tobacco usage) and biological changes (such as immune senescence, salivary flow, and changes in healing capacity) across the life course, the likelihood of developing conditions such as dental caries, periodontal disease, abscesses, and ultimately tooth loss, increases with age (Roberts and Manchester, 2005; López et al. 2017; Müller et al 2017). Periodontal disease and dental caries are also potentially risk factors for other health conditions, such as cardiovascular disease, respiratory infections, and cancer, due to the inspiration of pathogens from the oral cavity (DeWitte and Stojanowski, 2015; Müller et al 2017). In addition to increased risk of development of dental disease with age, increasing sugar consumption during the 18th to 19th centuries and paucities in dental hygiene strategies meant that dental disease was particularly prevalent (Corbett and Moore 1976; Western and Bekvalac 2020). Thus, due to the potential for the progressive loss of teeth over the life course, tooth loss was inextricably associated with old age during this time (Ottaway 2004:33).

As noted, Margaret (Skeleton 36, Hazel Grove) was edentulous, and Mary (Skeleton 5.23, Cross Street) had lost at least 21 of her teeth during life. Older females (aged 66+ years) were also more likely to have edentulous maxillae and/or mandibles in the known age-at-death sample from London (Table 3). Extensive ante-mortem tooth loss impairs mastication and may have necessitated a change in diet to softer foods (Müller et al 2017). Depending on one's socioeconomic status this could have led to nutritional deficiencies and potentially heightened risk of poor health resulting from malnutrition and vulnerability to infection. A variety of dental prostheses (dentures) were available during the 19th century, but likely only to those from wealthier backgrounds until the development of more widely affordable Vulcanite dentures in

1853 (Rueggeberg 2002; Henderson et al. 2013:296; Henderson et al. 2015:93). Extensive tooth loss can also lead to changes in facial appearance (Appleby 2010, 2017; Western and Bekvalac 2020: 176), and prostheses may have been used to help maintain appearance as much as to aid the mastication of food (Henderson et al. 2015:93). Tooth loss was often a source of anxiety for women during this time, being a visual indicator of advancing age (Newman and Turner, in press). Records of working-class single women reveal anxieties concerning loss of teeth, and by proxy an aged appearance, when discussing precarity in employment prospects (Vickery 2013:884).

Extensive degenerative joint changes were seen throughout Margaret's skeleton (Skeleton 36, Hazel Grove: Table 5). Women are more prone to developing osteoarthritis, potentially due to the anti-inflammatory role of oestrogen in cartilage maintenance and decreasing levels of this hormone associated with menopause (Western and Bekvalac 2020: 192-3). However, males and females in the known age-at-death sample did not differ significantly in terms of frequency of joint disease, and there was a higher prevalence in spinal joint disease and extra-spinal osteoarthritis in males in Cross Street. There were also slight differences in frequency of osteoarthritis by joint complex between males and females, and between Cross Street and the known age-at-death sample from London. This is likely related to different influences on susceptibility to degenerative joint changes due to sex, gender, genetics, social status and geographic location, and warrants further in-depth study alongside other markers of activity. Overall, the generally high prevalence of spinal joint disease and extra-spinal osteoarthritis in the palaeopathological data is unsurprising, but pertinent when considering functionality of advancing age in past populations. However, attributing evidence of degenerative joint changes to lived experiences of pain and reduced mobility in past populations can be problematic, as experiences are highly individualised (Appleby 2010), and a weak correlation exists between joint changes seen in radiological examinations and actual symptoms (Waldron 2012:518). Nevertheless, some locations may be more liable to cause pain than others, such as the base of the thumb, the medial compartment of the knee, and the hip (Waldron 2012:518; Appleby 2010). In cases where individuals did experience functional limitations due to joint disease, this may have impacted on occupation and ability to continue to self-support.

A relatively high crude prevalence rate of fractures was seen in Cross Street (particularly for males) and the known age-at-death sample (equally for males and females). A previous study on 18th-19th century assemblages from London identified a higher prevalence of fractures in males compared to females, and linked their accumulation of healed injuries over time to hazards presented by living and working in an urban environment, and to a lesser degree with interpersonal violence (Mant 2019). In the current study, fractures were not separated into those potentially related to interpersonal violence or accidents, as both types of injury mechanism can produce similar fractures (Judd and Redfern 2012: 365). Most fractures seen in the males in Cross Street were spinal compression fractures and rib fractures. Likewise, the spine was frequently affected in both males and females in the known age-at-death sample, in the form of compression fractures and spondylolysis. These types of fractures are potentially indicative of accidental- or activity-related injuries (Roberts and Manchester 2005). For female individuals aged 66+ years (known age-at-death), the highest prevalence of fractures was seen in the upper limb (18.0%, n=7/39). This included five individuals with healed Colles' fractures of the radius, which are commonly associated with falls onto an outstretched hand, particularly in women over the age of 50 years (Dandy and Edwards 2008). Falls are very common amongst older individuals, who have a heightened susceptibility to injury due to comorbidities such as osteoporosis, and are one of the leading causes of death in the elderly due to the resultant decline in overall health (Kenny 2005:131-132; Ambrose et al. 2013). However, because it is not possible to discern the age at which healed fractures occurred (Judd and Redfern 2012), these patterns are representative of the accumulation of risk across the life course, and do not necessarily relate to the period of old age. Only four individuals in this study had evidence of unhealed/healing fractures, three being males with unhealed rib fractures (one from Cross Street and two from the known age-at-death sample), and one being Margaret (Skeleton 36, Hazel Grove: see below).

While the multiple healed, healing and unhealed fractures seen in both Mary (Skeleton 5.23, Cross Street) and Margaret (Skeleton 36, Hazel Grove) (Table 5) may be indicative of traumatic events experienced during life, some shortly prior to death, they are likely linked to progressive loss of bone density associated with the ageing process. Osteoporosis is a major cause of morbidity and mortality in the elderly in the present day, with susceptibility to fragility fractures in response to minimal force leading to chronic pain, a need for extensive care during recovery, and a subsequent loss of independence (Langer et al. 2016). The bones of both individuals were notably light, and their respective ages at death of 64 years and 88 years indicates that they may have been susceptible to this condition. Fragility fractures tend to occur in load-bearing regions such as compression fractures in the vertebrae, and in areas vulnerable to injury from trips and falls such as the ribs, distal radius, and the femoral neck (Brickley and

Ives 2008:151). Two vertebral compression fractures of lower thoracic vertebrae (T11 and T12) were identified in Margaret's skeleton (Skeleton 36, Hazel Grove), but not fractures of the femoral neck or distal radius. However, both women had multiple rib fractures, for which there is a higher risk of complications and mortality in older people, and for whom even coughing can lead to injury (Brickley 2006). Multiple fractures within the torso, such as those experienced by Margaret (Skeleton 36, Hazel Grove), can lead to 'flail chest', where instability of the chest wall can lead to severe impairment of respiration, lung injury and significant pain when breathing (Brickley 2006; Beck et al. 2010:724). Such injuries are commonly a result of motor vehicle accidents, falls from heights, industrial accidents, or assaults, but are also rarely associated with osteoporosis (Beck et al. 2010:724). Margaret (Skeleton 36, Hazel Grove) also had evidence of a sternal fracture, which can result from blunt force trauma to the chest, but which is also seen in elderly patients and post-menopausal women due to osteoporosis (Khoriati et al. 2013). Bilateral scapular fractures, which affected both Mary (Skeleton 5.23, Cross Street) and Margaret (Skeleton 36, Hazel Grove), are usually associated with injuries of very high force (Tuček et al. 2013:659), but have also been identified in a 73-year-old man as a result of a low energy fall (Christofi et al. 2008).

Multiple rib fractures combined with pseudofractures of the scapulae were also noted in two individuals from 18th to 19th century London, and were attributed to vitamin D deficiency osteomalacia (Brickley and Buckberry 2015). The skeletal elements most commonly affected by osteomalacic fractures are the scapulae, vertebrae, ribs, pelvis and long bones (see Brickley and Ives 2008; Ives and Brickley 2014; Brickley et al. 2018). Thus, due to the location and the nature of the fractures and pseudofractures seen in Margaret's (Skeleton 36, Hazel Grove) and Mary's (Skeleton 5.23, Cross Street) skeletons, vitamin D deficiency should also be considered. Due to age-related physiological and lifestyle changes, older adults are at greater risk of developing osteomalacia (Ives and Brickley 2014). However, as these are also predisposing factors to osteoporosis, the two conditions frequently co-occur and are to an extent interlinked, with estimates that around half of post-menopausal women with osteoporosis in the UK today are vitamin D deficient (Daroszewska 2015).

Margaret (Skeleton 36, Hazel Grove) also had numerous well-healed depressions on the cranial vault, located on the frontal and parietal bones. While cranial trauma may result from interpersonal violence, it is also frequently related to accidental falls or blows (Aufderheide and Rodríguez-Martín 1998). Thus, the suite of fractures seen in both case-study skeletons is suggestive of the susceptibility of older people to injuries, some of which may be due to underlying skeletal pathologies such as osteoporosis and osteomalacia. Delayed functional recovery and restrictions in capacity for self-care and independent living following a fall can lead to a 'vicious spiral' of declining physical fitness, risk of further falls, social isolation, and depression (Ambrose et al. 2013:52). For Margaret (Skeleton 36, Hazel Grove) to have reached the age of 88 years, considering the multiple injuries and pathological changes seen throughout her skeleton, it is possible that she had required long-term care or assistance with instrumental activities of daily life. However, injuries at different stages of healing (particularly in the ribs), multiple injuries on the same skeletal element and depressed cranial fractures can also be suggestive of physical elder abuse (Gowland 2016). Those responsible for elder abuse are often cohabiting spouses or adult children, and older women are more likely to be victims (Daichman 2005; Gowland 2016:515-6, 2017a). When evidence for injury of frequently-targeted regions (face, torso, and upper extremities) is seen in an immobile individual, as evidenced by presence of decubiti (pressure ulcers), these become increasingly suspicious (Gowland 2016:517, 2017a). Potential decubiti were observed in the femora of Margaret (Skeleton 36, Hazel Grove), notably the highly erosive lesion seen on the lateral surface of her right femoral midshaft (Fig.5e). Decubiti in bed-ridden individuals commonly occur on the sacrum, greater trochanters of the femora, calcanei and back of the cranium; in chair-ridden individuals, they occur on the ischial tuberosities (Gowland 2016:518). While the ischial tuberosities of Margaret (Skeleton 36, Hazel Grove) did appear to be porous, the surfaces were obscured by post-mortem damage, and no changes were seen in the other common locations for decubitus formation. Alternatively, these femoral lesions may represent venous leg ulcers. Leg ulcers can have many aetiologies, the most common of which being chronic venous disease (Pannier and Rabe 2013: 55). Predisposing factors for venous leg ulcers include advancing age, prolonged standing or sitting, and low oestrogen levels, among others (Raffeto et al. 2021:8). Thus, there is evidence Margaret (Skeleton 36, Hazel Grove) may have experienced reduced mobility, and was possibly chair-ridden. While fractures can occur during care provision in those suffering from a loss in bone density (i.e. in those with osteoporosis and/or osteomalacia) due to the fragility of their bones (see Table 5; Gowland 2016:518), the patterning of multiple healing and unhealed fractures alongside cranial trauma seen in Margaret's skeleton (Skeleton 36, Hazel Grove) warrants the consideration of a tentative case for elder abuse, whether due to shifting familial power dynamics, or institutional care.

While the bilateral clavicle fractures seen in Mary's skeleton (Skeleton 5.23, Cross Street) may also be suggestive of physical abuse, the pseudofractures seen on the ulnae, ribs, and scapulae are more synonymous with falls and metabolic disease, and in the absence of further evidence for immobility these are more likely attributable to accidental injuries. Thus, Mary (Skeleton 5.23, Cross Street) also demonstrated skeletal changes indicative of the biological impact of ageing and increased fragility, and the presence of healed and healing fractures in this individual is tentatively suggestive of episodes of increased reliability on others for support during recovery.

Prior to the implementation of the Old Age Pensions Act in 1908, there were no standardised provisions for the ageing population, who were instead reliant on poor relief from the parish or workhouse, philanthropic Friendly Societies, or on their spouses or younger family members for support (Thane 2000; Gazeley 2003:10; Ottaway 2004; Chase 2009; Western and Bekvalac 2020: 171). The middling to upper classes may have been better placed to provide for themselves into older age in terms of savings, income from land, or even through employment in less labour-intensive work (Yallop 2013; Western and Bekvalac 2020). However, wealthier women were reliant on the nature of provisions granted by wills if they outlived their spouses, thus downward social mobility could accompany old age depending on the circumstances in which they found themselves in widowhood (Ottaway 2004). In contrast, for economically vulnerable older individuals reliant on their ability to continue to work, advancing age brought risk of destitution and stigmatisation (Sbaraini 2022), and due to the cumulative effects of a lifetime of labour, deficient diet, and poor environment, debility may have set in from an earlier age (Newman and Turner, in press). The Old Poor Laws stipulated that children should support their aged parents, unless they risked impoverishment for themselves in the process, and wider networks of kin may also have assisted with care (Thane 2000:11; Ottaway 2004). For elderly women, cohabiting with their children may have been a desirable arrangement for the family unit, providing support for household chores and childcare (Ottaway 2004; Goose 2005; Western and Bekvalac 2020: 173-4). However, the elderly hoped, and were expected, to continue to support themselves for as long as possible, whether through personal savings, or continuation in employment (Thane 2000; Ottaway 2004). It was not until they were physically incapable of working that they could solely rely on outdoor relief: as the elderly were considered to be a 'deserving' category of the poor, they could receive support via provision of money, or amenities such as food or clothing (Ottaway 2004). It is likely that they relied on a combination of all three sources, to varying degrees, with advancing age (Ottaway 2004).

However, elderly paupers were increasingly seen as a burden as resources became stretched by a growing number of people requiring relief. With the introduction of the New Poor Law in 1834, there was a greater emphasis on indoor relief - i.e. almshouses, poorhouses and workhouses (Chase 2009). As women were more likely to outlive men, they would have needed to either continue to self-support (made difficult by the preferential employment of men and a generally younger workforce, lower wages afforded to women, or declining health), or rely more heavily on parish relief, especially if they had no surviving family to help support them in their final years (Chase 2009; Western and Bekvalac 2020: 171, 173-4). By the end of the 19th century a large proportion of elderly paupers were placed within the workhouse (Chase 2009). Many would live out the remainder of their lives there, marginalised from their communities.

'Old Age' – a predominantly female malady?

To summarise, in terms of social and cultural differences, the process of ageing differed for men and women in 18th-19th century England, with intersections aligned to status.

Cause of death data for those aged 65+ years in London in 1850 revealed a wide variety of factors leading to mortality. Many of these relate to general decline in health, but also to health issues associated with urban centres during this time (e.g. infectious diseases and respiratory conditions, see Table 4). The majority of conditions listed in Table 4 would not be visible or diagnostic in skeletal assemblages as they either only impact soft tissue structures, elicit osteological responses that are unlikely to be pathognomonic, or cause individuals to succumb to death before an osteological response can occur (DeWitte and Stojanowski, 2015). For example, conditions of the respiratory system were one of the most frequent causes of death in males and females aged 65+ years in the Registrar-General data. However, the palaeopathological data revealed a low prevalence of rib lesions in the Hazel Grove, Cross Street, and the known age-at-death sample. This may suggest that heightened vulnerability to mortality from respiratory conditions in older individuals meant that skeletal manifestations did not have time to develop (DeWitte and Stojanowski, 2015). Alternatively, it could reflect unpredictability in whether particular respiratory conditions (e.g. pneumonia and bronchitis) are likely to result in periosteal reactions on the ribs: in a study of individuals of known cause of death, Santos and Roberts (2006) noted that only 15.4% of individuals dying from pulmonary non-tuberculous conditions had evidence of new bone formation on the ribs.

Thus, the integration of historical data with bioarchaeological analyses can provide valuable insight into health patterns and susceptibilities in past populations. However, such records are not without their limitations, particularly those relating to the accuracy of pre-modern diagnostic criteria. More women than men were recorded as dying of cancer and conditions of the reproductive system, while men were more likely to be recorded as dying from a urinary condition, which may relate to limitations in cancer diagnoses during this time. Prostate cancer in particular was often misdiagnosed as a urinary condition, with the first official case described in 1853 (Denmeade and Isaacs 2002). The process of registration of deaths may also contribute to inaccuracies and misdiagnoses in the records. Following the introduction of civil registration in England in 1837, all deaths were required to be officially reported to a local registrar, including details regarding the age, sex, and cause of death of the deceased (Reid et al 2015). This was usually undertaken by a relative or neighbour, but also required certification of the cause of death by a doctor (General Registrar Office 1843; Reid et al 2015). However, this process did not necessarily ensure accurate reporting, as it often relied upon information provided by relatives/neighbours if a doctor was not attending to the patient prior to death, was subject to the individual practices of doctors when recording cause of death, and was impacted by inadequate knowledge of the aetiology of the symptoms observed (Reid et al 2015). This often resulted in the use of ill-defined terminology, as seen in the case of Mary (Skeleton 5.23, Cross Street), whose cause of death was recorded as 'decline'. Decline was classed as a "...vague, objectionable term…" (General Registrar Office 1843, 32) within death records, and typically referred to gradual wasting of the body, whether due to emaciation, tuberculosis, or another unspecified chronic disease process (General Registrar Office 1843, 14, 32). The use of 'Old Age' (or similar terms such as natural decay or natural debility) as a cause of death was also discouraged: "There is reason to believe that many of the diseases of the aged are not detected; and that the terms, "Old Age," and "Natural Decay," are often incorrectly assigned as causes of death" (General Registrar Office 1843, 14). Nevertheless, a quarter of individuals aged 65+ years in the Registrar-General (1850) sample within the current study were recorded as dying due to old age, and these individuals were significantly more likely to be women. Again, this is likely related to paucities in diagnostic capability at the time and provision of cause of death by lay informants. A previous study has suggested that increases in deaths from cardiovascular disease and cancer over time in Scotland from AD 1855-1949 may in fact be due to a 'rebranding' of deaths due to 'old age' following advances in medical knowledge and greater medical certification (Reid et al 2015). However, many doctors continued to provide 'old age' as a cause of death, despite it being considered a "confession of ignorance" by the

Registrar General for Scotland by 1872 (Reid et al 2015, 335). Thus, its persistence within medical nomenclature and certification of deaths may be associated with an expectation of death in older age groups and inconsistencies in recording between doctors, but also (in part) with the medicalisation of the ageing process. Despite deep roots in antiquity, the association of ageing with disease, degeneration, and decay gained momentum throughout the 18th-19th centuries in England (Ottaway 2004; Schäfer 2011; Yallop 2013:28-29). The principles of the four humours had persevered in Western medicine through to the 19th century, in which four components (blood, yellow bile, black bile, and phlegm) corresponded to four qualities of hot, dry, cold, and wet, and in turn to infancy, youth, maturity and old age (Achenbaum 2005:22; Schäfer 2011; Toulalan 2015:340). Here ageing was seen as a bodily process, with the body growing colder, drier, and harder, causing the skin to wrinkle, bones to become brittle, and the extremities cold (Yallop 2013:52). Mechanistic models of how the human body functioned also gained prominence during this time, where ageing was associated with the wearing out of a machine, which could be accelerated by factors such as occupation, diet, and individual lifestyle (Yallop 2013:67). Cultural delineations of 'green' (functional) old age and 'decrepit' (advanced) old age were also made based on perception of ability (Ottaway 2004), and intermixing of ideas of the ageing body trickled down to medical spheres in England to varying degrees (Yallop 2013:143). With the lines between chronology, bodily disposition, and lifestyle blurred, it was possible to age 'well' or 'correctly', with age identity reflecting moral behaviour and social standing (Yallop 2013:147). Thus, while the preponderance of women being recorded as dying from 'old age' may in part be related to greater mean female longevity, as supported by the increasing proportion of women seen in each advancing age category, it is also perhaps reflective of the social perceptions of ageing women by those attending to them towards the end of their lives. A greater importance was placed on the physical appearance of women in 18th-19th century England. Consequently, they were generally perceived to become 'old' at earlier ages than men (Covey 1992; Vickery 2013), and were more heavily ostracised as a result (Ottaway 2004; Thane 2006; Chase 2009; Toulalan 2015).

What is perhaps most compelling is that the use of ill-defined terminology such as 'old age' on medical certificates of cause of death persists in the present day, and a previous study found 'old age' was given as the immediate and only cause of death more frequently for women (75%) compared to men (25%) (Hawley 2003). This is despite the implementation of a more complex system whereby a direct cause of death is first recorded, followed by other contributing underlying conditions or events (HM Passport Office 2018). Guidance states that use of terminology such as 'old age', 'senility', or 'frailty of old age' should be avoided as the sole cause of death unless in limited circumstances (including the patient being over 80 years of age; HM Passport Office 2018). As cause of death data is used to inform population health monitoring, Hawley (2003) notes that the use of such terminology can lead to under-reporting of medical conditions, and impact on health care services and policy.

Functional decline (or its absence) is aligned to intersecting factors such as gender and status, and the accumulation of social, economic, and environmental inequalities throughout the life course (Higgs and Gilleard 2016; Chrisler et al 2016; Agarwal 2021). In the UK today older people of lower socio-economic status are likely to experience poorer health in later life, and from an earlier age (Allen and Daly 2016:1). This is particularly true for women, who are likely to live longer alongside long-term health issues (Allen and Daly 2016:4). Recent studies have revealed that physicians and medical students are more likely to maintain negative perceptions of working with older patients (Chrisler et al 2016) and Swift et al. (2016) highlight the implications of unconscious age bias in health care settings, including denial of treatment or misdiagnoses. As seen in 18th-19th century England, women in present day Western society continue to be perceived as old from earlier ages then men, their outward appearance is scrutinised more heavily, and frailty and dependence is included within the feminine gender role stereotype (Chrisler et al 2016). Thus, bioarchaeological and historical research can help us reflect not only on the intersection of ageism and sexism in medical practice in the 18th-19th centuries, but also on the increasingly negative narratives surrounding ageing in the present day (Higgs and Gilleard 2014, 2016; Ng and Chow 2021).

CONCLUSION

This study highlights the potential for the experiences of elderly women within 18th-19th century skeletal assemblages from England to be masked by methodological limitations and sampling bias due to increased susceptibility to bone loss across the life course. Through the combination of multiple lines of evidence from historical sources, population level paleopathological data, and individual case studies of known age-at-death, it has revealed valuable information regarding the final stages of the life course within the specific geographic and temporal context of 18th-19th century England. Here, social and bodily perceptions and experiences of ageing were tightly intertwined, and perhaps exacerbated by socio-economic structures and environmental conditions associated with 19th century urban centres. This ultimately drove how elderly women were perceived not only by their wider communities, but also by medical professionals, with tangible links to modern day treatment of those of advancing age.

However, it has been noted that "elastic boundaries make old age the most heterogeneous stage of life", highlighting the vast potential for variety in physical, mental, psychological, and social capabilities, alongside personal approaches to ageing and subsequent lifestyle (Achenbaum 2005:25). Recognising that 'older age' can encompass a relatively large proportion of an individual's lifespan, and thus a wide range of potential experiences (particularly as age progresses), the case studies presented are only representative of the impact of senescence within a specific context, and its associated social and cultural views. Thus, this paper cautions against a broad approach to interpreting old age in the past via skeletal remains, and highlights the potential for hidden heterogeneity in experiences due to preservation bias and differences in bodily decline and skeletal manifestation.

Further research is required to continue to forge this link, which is in part being driven by advances in skeletal age estimation techniques, but the value of placing detailed osteobiographies within their wider contexts is highlighted here. In light of increasing numbers of large-scale excavations of 18th-19th century cemeteries in the UK, with potential to recover individuals of known age-at-death, it is vital that opportunities to enhance our understanding of biological and social age and wider community care strategies in past populations are not overlooked.

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