# Demography beyond typology: revisualising death and data

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## Abstract

*With the digital recording of early medieval burial complexes in England now very advanced, this essay argues that such data can be harnessed to address broader questions about the communities represented. Taking an explicitly demographic approach, as is suggested, gives us a way of moving beyond some of the taxonomic concerns that still largely dominate the subject. We present a selection of methods aimed at profiling burial communities, with a view to understanding populations, their distributions, in-group composition, health and group and individual biographies. This essay then describes some of the advantages of integrating cultural and bioarchaeological evidence to enable us to think about demographic information at different scales.*

## Introduction

In a useful overview of the current health of the discipline, Yu Xie makes a powerful claim in support of demography: “It is hard to imagine that a social science can advance steadily without first knowing the basic information about the human population that it studies” (XIE 2000, 670). Archaeologists occasionally make similar statements. Shennan and Edinborough, for example, argue, “we cannot explain regional culture historical patterns without first understanding regional demography” (2007, 1344). For these authors, there is an explicit link between the structure of populations and social phenomena. Population heterogeneity and changes therein affect all aspects of human culture. “In its myriad forms”, Nam suggest, “it has global, national, regional, community, organizational, associational, household, familial and individual repercussions. It touches us in all contexts and at all times. It is our phantom social force, not conspicuous in its influence but there nevertheless” (1994: 1).

Such sentiments, and others like them, are relevant to archaeologists studying the burial archaeology of early medieval Britain. At a general level, the nature of the evidence from this period is well-suited to the types of questions deployed by demographers and can be harnessed to explore human populations with reference to size, density, distribution and vital statistics such as sex, age and mortality amongst a range of attributes, and the interplay between population and economic development. Burials of the period are numerous, have a good general spatial coverage—at least in lowland Britain—and are often closely datable. This period of maximal investment in burial has a range of both inhumation and cremation mortuary practices exhibiting regional and localised manifestations. Most cemetery excavations are incomplete and the known presence of buried communities is a function of later cultural developments, for example, excavations prompted by modern infrastructure development. We recognise, therefore, that there are many more sites yet to be found, but when used with caution the locations of burial sites may be used as a proxy for population distributions, which in turn can be compared with environmental data. This approach was first espoused by Davies and Vierck (1974) and latterly by Harrington and Welch (2014), exploring the environmental context and distribution of many thousands of burials in southern and central and northern Britain.

Collections of burials in cemetery groups also form easily-conceptualised ‘cohorts’, advocated by some demographers as the units through which social change can best be explored (e.g. RYDER

1965). In equating each cemetery group with one or more burying communities, archaeology has a ready-made sample population to examine the composition, heterogeneity and character of each. Archaeologists have long been interested in exploring how the cultural signatures of early medieval burials differ by age, sex, gender, and—in light of recent scientific advances—place of origin. Notable studies have related such patterns to social structures and changes occurring within sample communities over time (for example SHEPHERD on social status in 1979; WILLIAMS on identity and personhood within early medieval communities e.g. 2006, and SAYER on intra-site expressions of connectedness and kin-relations e.g. 2020).

Since the 1970s, skeletal evidence was routinely collected in a more coherent fashion, thereby opening up avenues to address questions about various aspects of past populations, including the life course, health and kinship (e.g. GILCHRIST 2012; and GOWLAND and KNÜSEL 2006). Many archives still hold a backlog of underexplored collections of human skeletal remains and while sometimes, as our projects have shown, these can be difficult to access for study, analysis of individual cemetery populations is a useful approach for thinking about the age structure of living communities.

With these extensive resources, we now have more evidence at our disposal than ever before. The authors, working on a range of separate but interlocking projects, have worked consecutively on building burial datasets for parts of central, northern and southern Britain, and an expansive common digital data set for early medieval burial in England and southern Scotland has now been digitised (BROOKES and HARRINGTON 2013; SEMPLE et al. forthcoming). Our previous presentations and publications describe some of the processes and difficulties we have encountered in initial work on the *Anglo-Saxon Kent Electronic Database* (ASKED), and then the more expansive projects, *Beyond the Tribal Hidage*, looking at southern Britain and *People and Place: the making of the kingdom of Northumbria,* both funded by The Leverhulme Trust. Together, these commensurate databases now comprise the individual grave catalogues of just under 20,000 burials and cremations, including 35,500 thousand objects, from over 1,300 burial sites.

By compiling data on each project using the same database structure and terminology, diverse burial records are on the same footing. We have previously termed this accumulation of data a census, but clearly, our data has the potential to extend beyond conventional methods of population analysis and to unite with emerging scientific data streams. The development of a demographic study of early medieval peoples is a gradual process and demands careful methodological thinking about the potential and pitfalls of the dataset. We present below the results of initial trials in re-formulating data for specific comparative purposes that seek to profile individual communities on their own terms. When viewed together with published and newly gathered bioarchaeological data, we can see greater nuance in the demographic information for these populations, which in turn can contribute new lines of enquiry relating to the composition of living communities, equities and inequities in the life course and even individual and community movement.

This article serves as an introduction to the ongoing collaboration between these projects, and the ways in which new projects like *People and Place* are helping to build compatible datasets that will enable much broader exploration of the impacts and changes felt by the people of this early medieval era in Britain. Here we focus on the potentials of population mapping using cemetery data, the opportunities for community profiling and for exploring the lives of populations at different scales of enquiry. The cumulative work of these projects is offering a unique opportunity to understand the lives of early medieval communities in Britain from the macroscale across time and place, through to the local community and cemetery and the individual level.

## Compiling a census?

To put the current situation in context, it is useful to reflect on the history of our discipline. The basis for archaeological research into the populations of early medieval Britain in the mid-first millennium AD has frequently been grounded in analyses of furnished burial, particularly the range of metal artefacts found therein. In the last decades, a shift in research methodologies has revealed a greater use of digital formats and their potential for multi-scalar analyses, beyond what can be achieved with disparate catalogues, detailed bibliographic research and forays into museum archives by lone academics. Our combined research group from UCL Institute of Archaeology and Durham University has reported changing and developing perspectives to the Sachsensymposium over the last 10 or so years, with presentations charting the development of methods common to our projects.[i]

When our first dataset, then known as ASKED (BROOKES et al. 2006; BROOKES 2007; HARRINGTON and BROOKES 2008) was in its planning stages in the late 1990s, the analogy with 'census building' seemed apt. The joint theoretical principle was to explicitly consider the archaeological data of burial from a 'bottom-up' perspective, rather than concentrate on elites evidenced by high-status metalwork and esoteric artefacts. We could take base-line information from publications, such as site location, grave number, age-at-death and associated artefacts, to mirror modern census concerns with collating data on geography, health and wealth. Such data produces just a 'snapshot in time' and this can only ever be partial picture (see the potentials and cautions outlined by Semple and Brookes on a necrogeographic approach, SEMPLE and BROOKES 2020). Problems with partitioning such data into phases are inevitable, but the approach still offers the opportunity to explore the environmental context and distribution of many thousands of burials in southern, central, and northern Britain. Henry Mayhew's work on *London Labour and the London Poor* (1851–61) also influenced our thinking, in that relative poverty could be mapped on a range of scales, based then on interviews with individuals. As census-builders we would of course both ask and answer the questions ourselves, in terms of what data to gather and how to formulate it and, critically, how to address issues of compatibility across apparently disparate cemetery groups.

Unlike a modern census, however, somewhat problematically we are answering for the participants – creating their names and defining the kinds of information that we can record. We are dependent as well on what survived into the archaeological record and what and how it was recorded from excavation. We also determine the questions we wish to ask, most notably around historically driven state formation theories, rather than allowing the dead to speak for themselves. Nevertheless, we have access to unique kinds of data, drawn from multiple strands within the disciplines of archaeology. While there are specific challenges, given its partial and incomplete nature, we propose that even so, the data has the potential to support new and unique inferences and access the nuances of people's lives and deaths, even as they may have experienced changing social, political and economic circumstances.

Taking its direction from the Tribal Hidage taxation document, *Beyond the Tribal Hidage* examined the wealth of people in southern Britain as represented by their burial assemblages. As such, the individual burial records created in their grid-referenced context, served mainly as placeholders for the distribution of artefact types, although with a residual concern for the less well-furnished people amongst them. *People and Place*, with an expansive central and northern British focus, revealed how the cemeteries in Northumbria were much less well-furnished, but still represented considerable numbers of contemporary people, for example the buried populations represented in the cist and flat grave sites of lowland Scotland. The need to achieve a balanced in-depth analysis of all graves across the geographic extent of Northumbria forced us to consider approaches different to those used in other projects.

The benefits of the census model perhaps require explication. It is comprehensive rather than selective in its data accumulation. It does not place one group above another as a focus of investigation. It does not privilege well-preserved individuals, graves, or cemeteries, over partial, eroded or damaged archaeological data. In this way, as a census, it provides a snapshot of a population at any one time. By ensuring the diverse data is consistently recorded, it can be handled as a sum of its parts and used to identify the extent and nature of (dis)advantage as well as providing a secure basis for the development of future research, as a point of reference.

Within our projects, our data facilitates more than just a census: we are compiling multiple snapshots of the buried population at different points in time and this allows us to explore and detect the dynamics of the period, seeking out information on changing demography, wealth, health and status over time. Of real interest in this particular period is the distribution of populations, which we can reference to their geographical and physical environments alongside comparisons in the composition of populations, for example by age and sex, but also traced over time. Drawing on the unique nature of our source material, we can also map the range, character, and distributions of burial expression and how this change through time. Most importantly, we can explore the correlations between and the factors that affect these population attributes.

## New approaches

We are working with data from several projects is representative of multiple communities from across northern and southern Britain in the early medieval era  ftaking samples from across our projects and regions – by calibrating the datasets against each other, these still offer an exciting and viable basis from which to create and test models. There are methodological implications, however, if we adopt the perspective of demography. The first refers to population mapping: the harnessing of these data in a common gazetteer makes a full regional compilation possible, at least at the level of plotting sites. These can be used to examine the geospatial distributions of population at differing scales from the macro to the regional. Each scale of assessment has its limitations, however – the record is inevitably incomplete and a wide range of environmental, social and cultural factors influences each community and its practices. Working at scale can produce generalisations that, although useful, can mask significant variations. A second implication of the demographic approach is a focus on the composition of groups. Heterogeneity within and across cohorts can be examined through a range of data, including social and biological markers, but one of the main obstacles to carrying out intra-group analyses is the difficulty of finding comparable data among widely differentiated practices. Population heterogeneity can also be examined from the perspective of bioarchaeological evidence, and in this paper, we show how we are integrating this within a multiscale demographic approach.

### *Population mapping*

Regional studies suggest that the locations of early medieval burial sites were significantly determined by environmental conditions of soils and land cover, and then by considerations of access, topography and cognitive landscape.

The tendency for sites to concentrate on free-draining soils as opposed to heavier clay formations can now be quantified at regional levels. In East Anglia (Norfolk and Suffolk) amenable sandy, chalky, clay or loamy soils that are easy or moderately easy to cultivate and which are at least moderately fertile, account for 30.37% of the total soil-cover. From this region come 74 (51.75%) of the 143 known early Anglo-Saxon burial sites, or 68.53% of sites if a 200m buffer around good-quality soils is drawn. A similar tendency is found more broadly among burials south of the Thames, for example in Surrey (see HARRINGTON and WELCH 2014, figure 22). Among burial sites of the fifth to sixth

centuries in these counties, between 66–77% were located on free-draining soils of moderate to good fertility; in the sixth and seventh centuries this proportion had dropped to 59–77% but still significantly correlated. Within the full seventh-century extent of the Northumbrian kingdom, which stretched from the Humber to the Firth of Forth and connected the Irish and North Sea coasts, the proportion of free-draining and high fertility soils is much lower than in southern or eastern England, accounting for just 21.7% of the available land. Of this, high fertility soils account for just 4.71% of land, all of which lie within the county of Yorkshire. Yet, of the 892 actual and potential sites documented, 632 sites (71.5% of all cemetery sites across Northumbria) were located on or within 1 km of free draining soils and 377 sites (42.7%) were located on the tiny proportion of high fertility soils in Yorkshire (Figure 1). We know, of course, that uplands were in use for grazing and pasture, but given the regularity with which early medieval settlement and cemetery evidence appear to have been co-located and fairly proximate, we can assume that early medieval populations in the north were largely resident in proximity to decent and workable arable land (BANHAM and FAITH 2014).

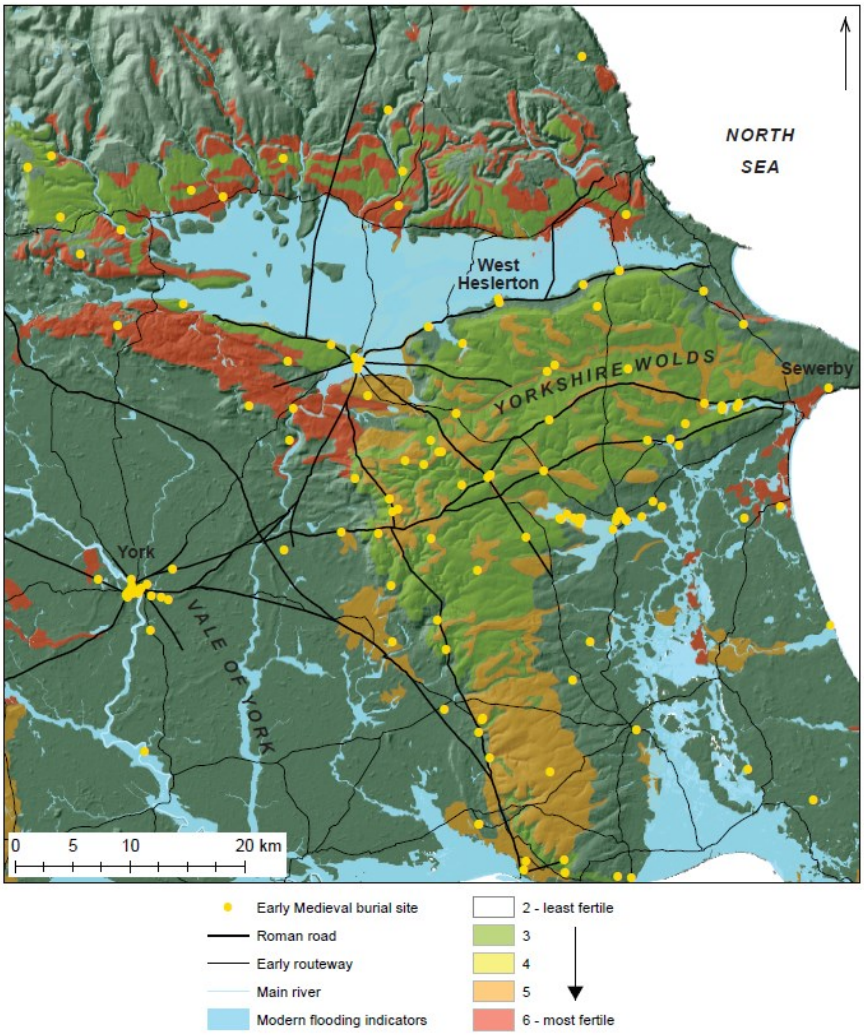


*Figure 1. Distribution of identified cemeteries and burials and potential funerary sites in relation to information on modern soil fertility. By Stuart Brookes © People and Place Project.*

Beyond distribution mapping, the listing of burials in a common database allows us also to identify relative changes in regional population. Aoristic analysis of the total numbers of individuals in the databases allows us to derive a chronological synthesis of population evidence (Figure 2). Taking the date ranges assigned to each grave, this technique calculates the probability of each individual entity—in this case people—falling into a chronological bin (RATCLIFFE 2000; JOHNSON 2004; CREMA 2012).

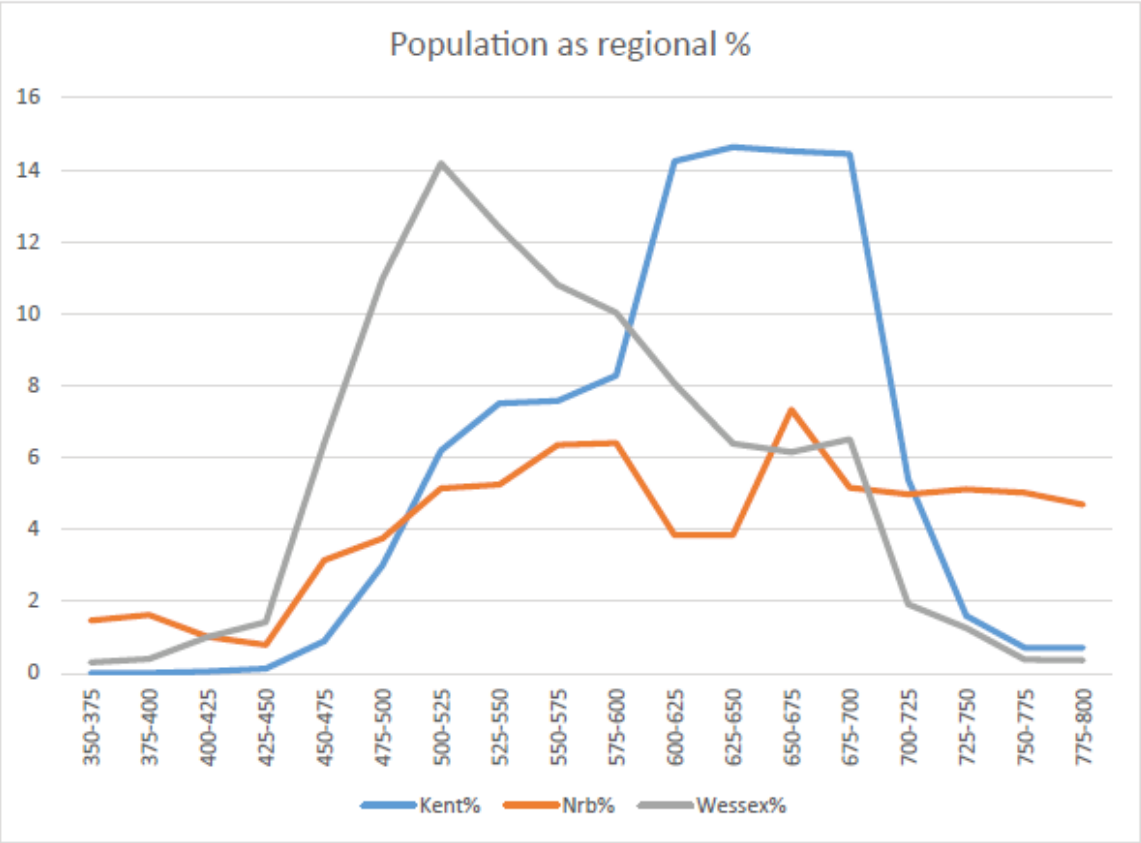


*Figure 2. Aoristic analysis of individuals listed in the databases, as regional percentages. Kent: n=4541; Northumbria: n=5526; Wessex: n=4998*

Partly, these graphs reflect how information has been inputted into the database. With dating precision amongst Northumbrian graves much more difficult to define, date ranges tend to be broader, hence the population figures tend to be distributed evenly across the whole period. The same is not the case with burial complexes south of the Thames, where the contrast in relative population numbers is striking. High resolution $C^{14}$ dating of some 74 individuals from 18 sites may allow us to bring greater chronometric precision to the demographic pattern evident for Northumbria, in particular the apparent dip in numbers of burial sites from the mid-late sixth century to the early seventh century.

## *Community profiling*[ii]

A digital approach to cataloguing and recording cemeteries also allows for the relatively easy analysis of patterns within a dataset at a variety of scales. Here we can point to the distribution of typologised artefact types and the comparison of different coefficients, for example sex with certain grave goods; these can reveal that certain types of social behaviour are very regionally distinct.

However, problems arise of how to deal with those burials without grave goods, or with poor skeletal survival. Many publications of cemetery excavations use standardized formats, including grave plans. We observed that much of this published evidence was under-examined, but when analysed here the data proved usefully nuanced. This observation of regional distinctions has become particularly pertinent in our most recent work that seeks to compare the burial records of southern, central and northern Britain (HARRINGTON et al. 2020). Despite having similar historical narratives—kingdom formation, Christianisation, elite control – the archaeology of the two study regions (encompassing parts of south, central and northern Britain) presents different problems, particularly the stark contrast in the consumption of metalwork – usually regarded as one of the main entry points to interpretations of burial practices, social identity and religious orientation. This absence of metalwork in central and northern Britain is compounded by the different qualities of the material evidence brought about by taphonomic, social and even archival processes.

While the range and content of the databases produced offers scope for researchers as a source of macrodata, they also bring methodological challenges of how to access, analyse and disseminate the uniqueness of each burial event in the context of their community and across the wider landscape. Body position and orientation are commonly recorded attributes that can be applied across the entire composite of data from all projects, although challenges are still evident in the range of information and compatibility across different reports and data sources. As our discussions below reveal, grave 'space' or the room around a body in an inhumation context is another attribute that can be tested, alongside the more traditional cross-referencing of the distribution and inclusion of artefacts (HARRINGTON et al. 2019).

Taking a sample of seven sixth-century cemeteries from northern/central and southern Britain, for example, reveals a considerable consistency in orientation and burial position (Figures 3 and 4).[iii] This is especially the case with Mill Hill, Deal, Kent, perhaps reflecting a stronger continental or Frankish influence in burial rites. In the southern cemeteries (Butler's Field, Lechlade, Gloucestershire, Market Lavington, Wiltshire and Mill Hill, Deal, Kent), the orientation of the grave, south-west to north-east, dominates, rather than a west-east orientation that might be expected for a community in contact with Christianised elites across the channel. In contrast, the buried communities surveilled by the *People and Place* project, from central and northern Britain (Scorton, West Heslerton and Sewerby all in Yorkshire, and Castledyke South, Lincolndshire), all display a far greater variety in both orientation and body position. These communities appear to be freer in their choices with greater opportunities for variations in body placement and orientation. Supine burial rites dominate both study areas. If these are excluded from the sample, however, the proportion of flexed and extended burials is similar across southern, central and northern regions with the exception of Kent.


*Figure 3. Location of sites mentioned in the text.*

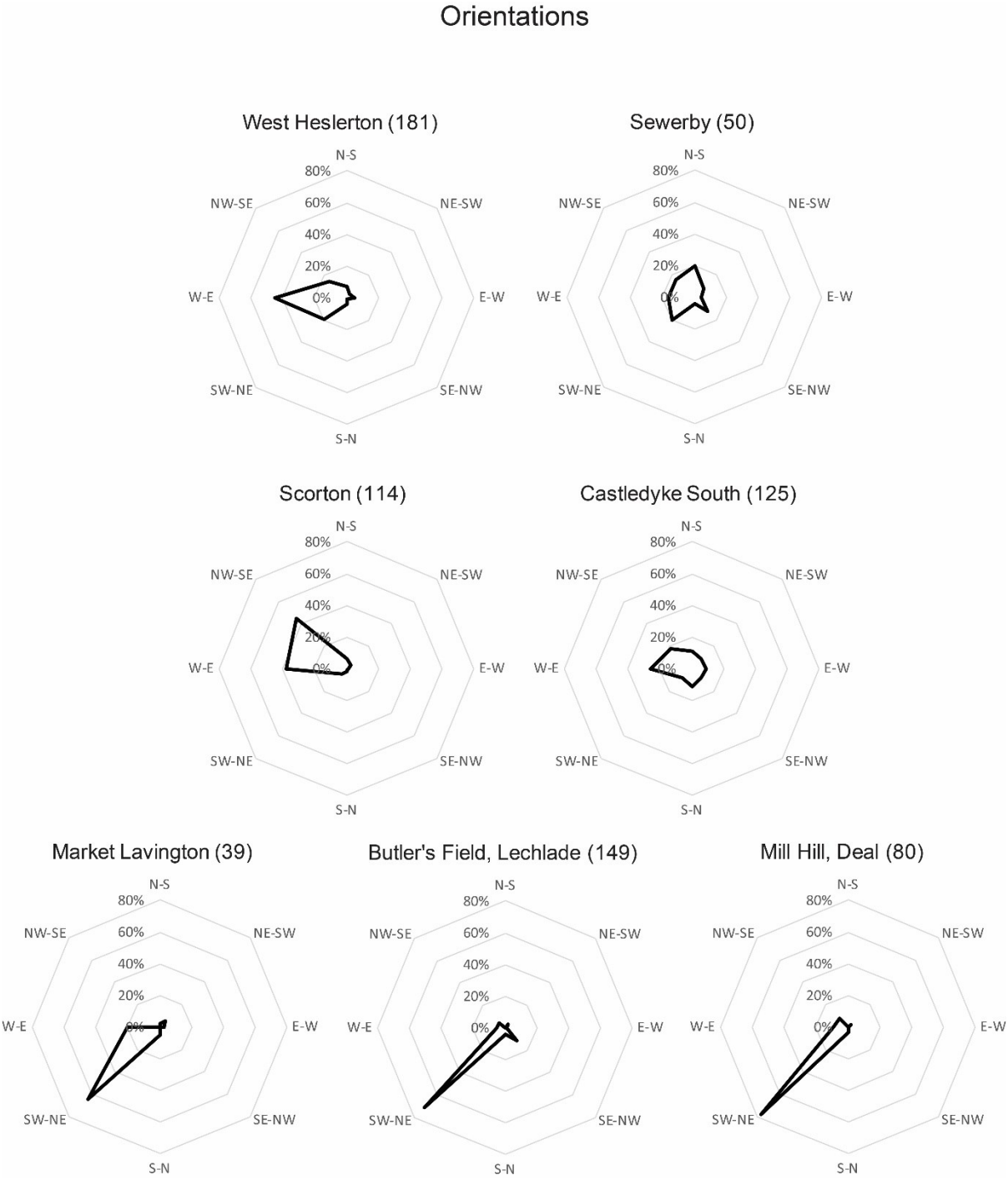


*Figure 4a. The grave orientations recorded in a range of sixth-century cemeteries located in southern, central and northern Britain.*

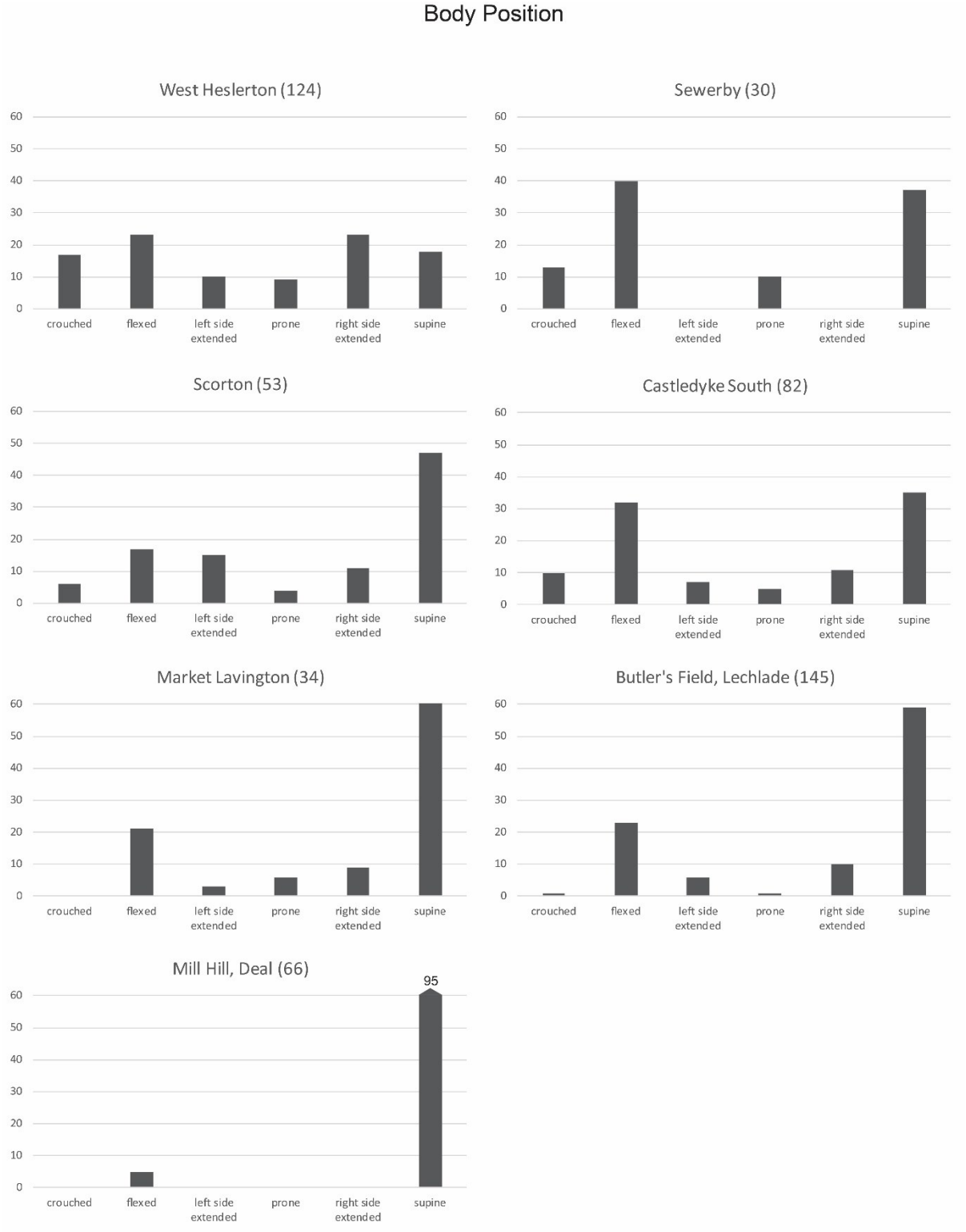


*Figure 4b. The body positions recorded in the same range of cemeteries.*

Another noteworthy characteristic is the amount of space in graves. We can assume there was pre-planning in the digging of most grave cuts, as a purposeful rather than a hurried or random exercise. Certain burials appeared to have additional space around the body giving a larger than obviously necessary grave cut. We surmised that this observation might relate to the processes of deposition, perhaps portable wealth in the form of organic material that had not survived. Our questions here were whether this was a demonstrable feature (rather than based on perception of the grave

drawings) and how prevalent this might have been across the study regions explored by our common projects (HARRINGTON et al. 2019).

Digitisation of the burial plan and outline of the body allow for a crude quantification of the amount of empty space in graves (Figure 5). We have trialled comparison between these seven cemeteries from the northern and central regions of Britain and the south and initial results show that while average grave size varies across the sample, the average proportion of 'additional space' at most sites is relatively similar at 69–77%. Kentish cemeteries may again be outlying in the investment in size of grave and the presence of 'additional space'. The single Kentish cemetery in this study at Mill Hill, Deal, revealed that the proportion of space in the inhumation graves fell within the range of other southern, central and northern sites in this study, but there was significantly less empty space in the graves with the body and goods taking up a greater proportion of the volume. Also noteworthy is the Castledyke South (Lincolnshire), which has the second smallest average grave size, but by far the largest 'voids'. The demography of the community might be at play here – in that larger numbers of children or adolescents in this population may lead to a smaller average grave size. On average, however, the graves of these younger individuals at Castledyke South also contain greater amounts of empty space, an attribute not necessarily explainable by the smaller body size combined with the digging of a standard sized grave. These results would point to the preparation and digging of the grave area to accommodate not just the deceased, but quantities of now absent organic material.

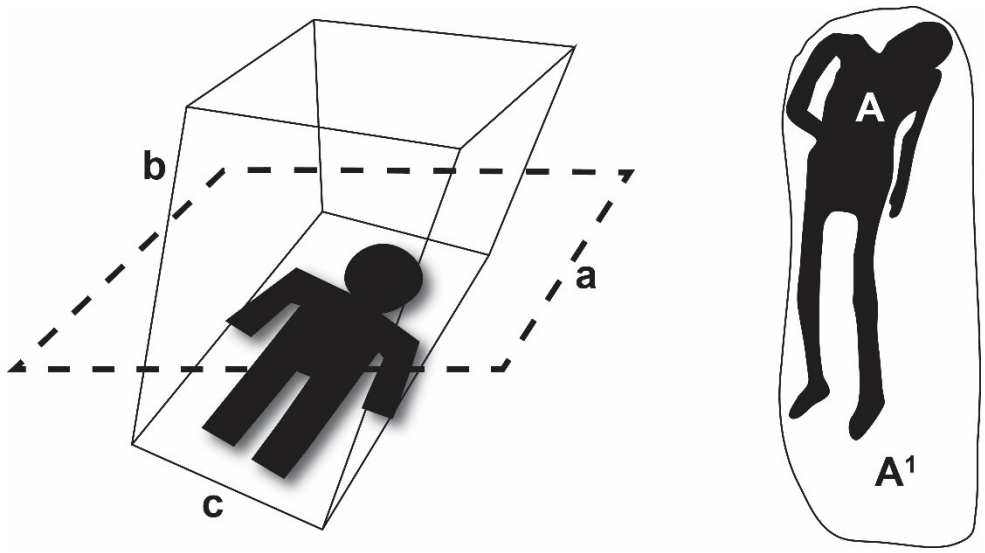


*Figure 5a. Volumetric analysis of graves is complicated by a number of factors: (a) the degree that graves have been truncated after burial; (b) whether the grave cut was vertical or sloped; (c) the horizontality of the surface and base of the grave cut. To mitigate against the effects of these unknown coefficients, two-dimensional area analysis was calculated in this analysis as a proxy for 'volume' by deducting the area of the body 'A' from that of the grave 'A1';*


*Figure 5b. Average grave size and the percentage of empty space; 5c. percentage of empty space by age band. NB Bone survival at Scorton, Yorkshire, was too insufficient to include Scorton in this calculation.*

Moving on to piloting comparisons of furnished burial rites through surviving artefacts, one way to try and simplify the evidence of over 200 different object types known from early medieval burials across southern, central and northern Britain is to group them by function. We have piloted grouping objects into six general categories (Table 1), to facilitate comparison with the underlying assumption that each of these categories might reflect an aspect of the burial persona. This allows us to overcome the variability in the number or quality of objects within each category. This gets us around the problem of simply quantifying objects and allows us to compare across quite heterogeneous datasets. The number of categories present for each body were totalled, and then compared by biological sex where known, both within and between sites (Figure 6).

*Table 1. Six categories of grave object.*

| Category | Object types |
|---|---|
| Grave equipment | coffin, bier etc. |
| Dress fitments | buckles, brooches |
| Containers | boxes, ceramic vessels, copper alloy bowls, glass vessels |
| Weaponry | swords, shields, spears, seaxes |
| Tools | spindle whorls, awls |
| Personal effects | combs, beads (glass or other material), knives |

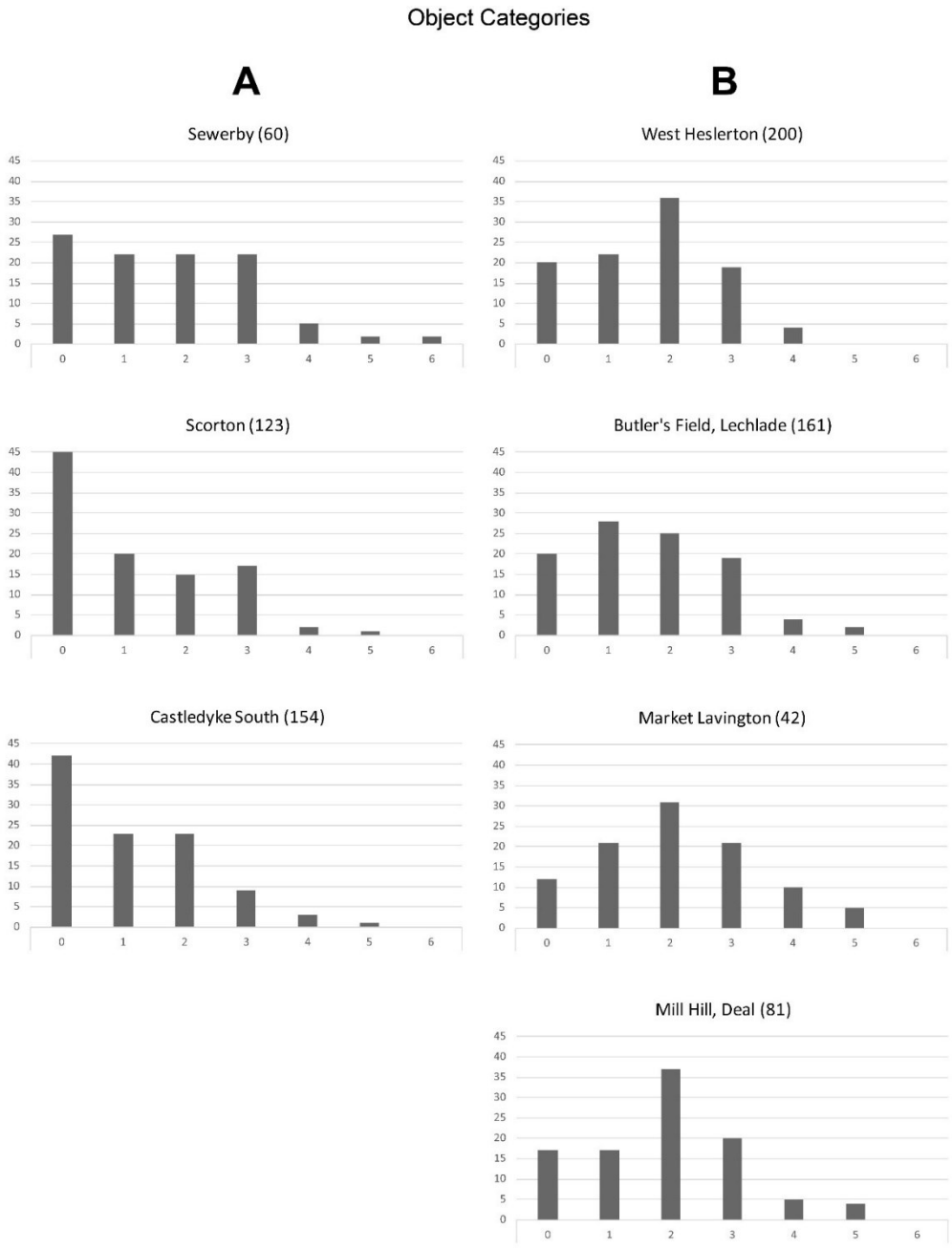


*Figure 6. Percentage frequency of object categories.*

The resulting community profiles superficially fall into two main profiles: (A) and (B). For (A) there is a more-or-less steady decline from most individuals without any category of grave-good to those with five or six. The other profile resembles a normal distribution with most burials interred with two, or less frequently, one category of object. The steady decline profiles are all from cemeteries in central Britain, but the profile of the Sewerby community (East Yorkshire) is less pronounced than Scorton (North Yorkshire) or Castledyke South (Lincolnshire). By contrast, the other northern cemetery—West Heslerton (East Yorkshire)—aligns more closely with that of southern communities, particularly with Mill Hill, Deal.

Fewer distinctions between central and southern communities are visible if only well-accompanied individuals of categories 4–6 are considered. If this calculation can in some ways be equated with a 'consumer group', it appears that this was comparable in every community in both size and material expression – a factor that may indicate some level of mutual, supra-regional determination. Greater variability between communities is visible amongst the 'simpler' burials, i.e. those with 0–2 categories of objects. At Scorton and Castledyke South, most burials were interred with no objects in any category and a decreasing number had 1 or 2. At Mill Hill, Deal, Market Lavington (Wiltshire) and West Heslerton this tendency is reversed, with a majority having two categories of objects.

While we can only compare the artefactual investment in graves where objects survive, at least in terms of the archaeologically visible categories used here, central and northern early medieval communities seem to have had less to invest or needed to invest less in the grave at death, especially in terms of metalwork. The site that stands apart from this is West Heslerton where investment in terms of goods is more on a par with the southern cemeteries. It is pertinent to note that the environmental context of this site – on a Wold scarp above a river – is like that of the southern cemeteries around the chalk downs. However, in each case there is a 'consumer group' who at death were invested by the living with more complex assemblages, by comparison with their deceased neighbours, perhaps pointing to similar emergent intra-group processes of social stratification.

Considering the evidence, we can pose some summary observations. The sample southern communities and those explored north of the Humber are distinctive in aspects such as grave orientation, and to a lesser degree body position and object categories. There are also, in some respects, significant differences between neighbouring communities, so that individual communities in central and northern Britain can appear less regionally distinctive as a collective group. Mill Hill Deal is different. Here, more normative ideas appear to have been communicated in ways that affected mortuary practices. It remains to be seen whether this site is representative of others in the early Kentish kingdom. If so, this conformity to a narrow suite of burial norms could reflect 'Kentish' behaviour in the funerary sphere in which tighter social controls were exercised over mortuary expression.

This contrasts with the more variable behaviours visible in central and northern early medieval cemeteries that suggest a greater independence of choice about investment and ritual at death. At the macro-scale, the demographic approach also allows us to perceive, in both furnished and unfurnished rites, potential aspects of inequality in northern and southern regions, signalled by variable types of investment, not just of objects, and articulated via display at death. Allowing for the inherent intra-site complexity of cemeteries, our work in drawing out these broad trends provides a less charged way of examining variable social complexity than a simple focus on goods as wealth indicators, dress items and regional distinctiveness and monumental investment. It allows us to see regional differences in praxis in the round, and use these to characterise something of the

differing, if complex, social relations and investment at death evident in the early medieval cemeteries of northern/central and southern Britain.

### *Bringing in bioarchaeology*

The *People and Place* project has developed upon predecessor projects with the collection and use of existing and new bioarchaeological data. 5526 individual burials or graves have been recorded by the project in Northumbria, using published and grey literature reports, the English National Record of the Historic Environment (NRHE), CANMORE (the National Monuments Record for Scotland) and regional Historic Environment Records. Only 3562 of these were inhumations that preserved skeletal remains, the remaining 1964 burial entries recorded, reflect cremation deposits and findspots of material that could indicate an inhumation or cremation event or cemetery. All bioarchaeological evidence available from the unpublished and published reports on age and sex has been integrated into the database. Exploring this secondary human bioarchaeological data, however, requires considerable care. In many cases, the remains are too fragmentary or damaged to provide enough bioarchaeological information about the individual. Different methodologies (morphological attributes used to assess age, sex, stature, and pathologies) are also used in various earlier publications or grey literature sources and this lack of standardisation can create issues of comparability of datasets. Furthermore, age categories can vary significantly between cemetery reports; for example, from general terms such as 'adult' and 'child' to specific age categories for infants, juveniles, young adults, adults and the elderly. In terms of sex, researchers have often ascribed a male or female gender to a burial based on the furnishings accompanying the individual. While dichotomous gender assemblages often do 'map' onto biological sex for this period, they do not in all cases. It is essential, therefore, that we allow space for non-binary gender identities in the archaeological record of the early medieval period. The practice of determining biological sex based on grave goods will render such identities invisible and reproduce a binary gender ideology that may not accurately reflect the past (GELLER 2017).

After careful assessment of this broader secondary data, the age-at-death can be seen in Figure 7. Age at death is broadly distributed with 17% non-adult, 48% adult and 35% unknown. While we are not comparing like with like in terms of age span, it is still interesting to note that higher numbers of people feature within the 26-45 years category of age-at-death, at least in terms of investment in the inhumation rite, than in the 18-25 years category.

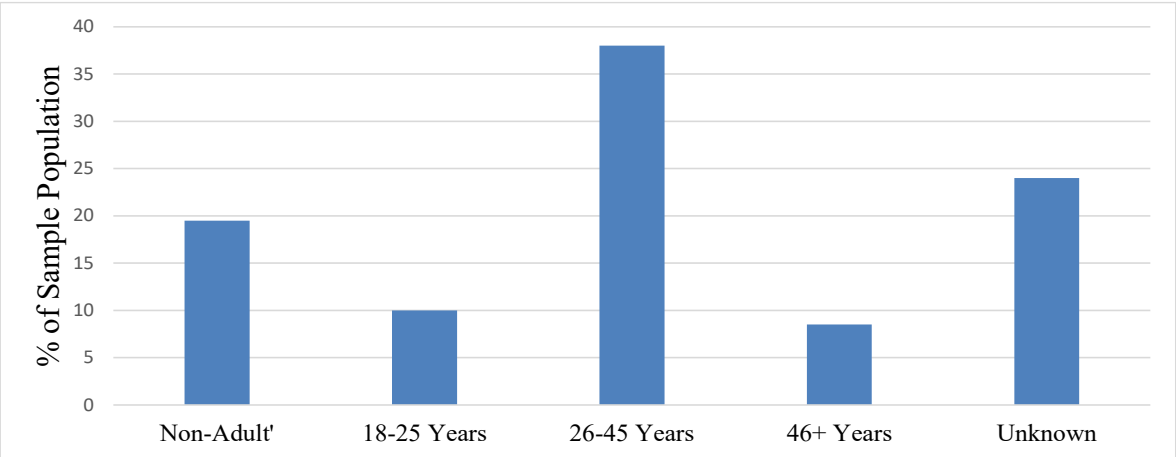


*Figure 7. Age-at-death distribution based on published and unpublished secondary data and analysis from central and northern regions under study (n=3562).*

Part of the project remit of the *People and Place* project was also to test out such secondary data by undertaking primary analysis of surviving human skeletal remains where collections survived and could be accessed. This bioarchaeological strand of applied study enabled osteological and palaeopathological assessment of a sample population of *c.* 832 individuals from twenty-five inhumation cemeteries from central and northern regions of Britain (Appendix 1). This extensive bioarchaeological dataset is still being analysed, but close-grained investigation has revealed some additional interesting demographic variations. In terms of this sample population, where new scientific assessment has taken place, age-at-death is similarly distributed to the secondary data in terms of 18.9% non-adult but with far higher numbers of identified adults (18+) (79.5%) and a much smaller proportion of individuals where the age is unknown (1.7%) (Figure 8).

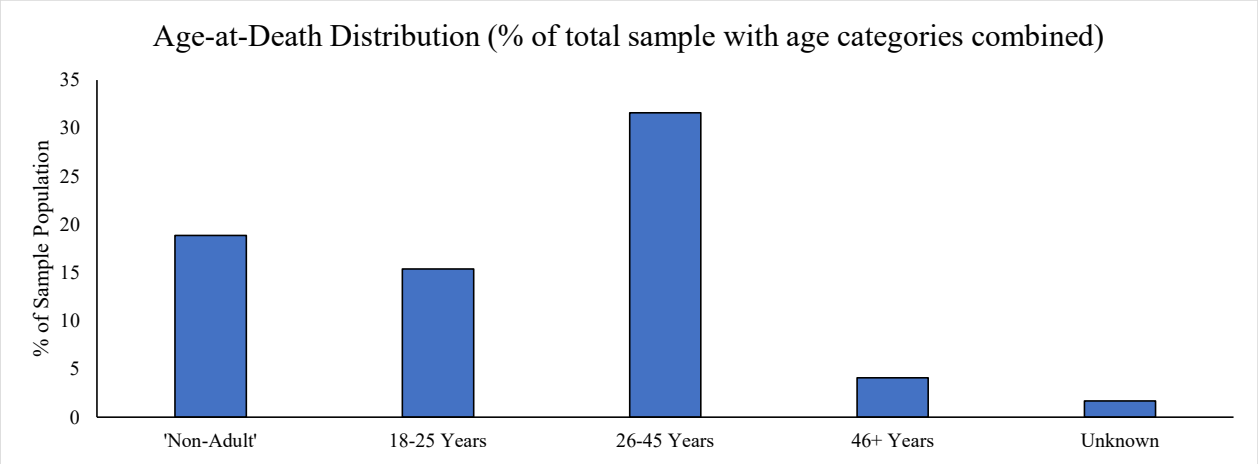


*Figure 8. Age-at-death distribution based on new bioarchaeological study of northern and central sample population shown as % (n=832).*

Broad categorisations in relation to biological sex are also reinforced, if assessed first for the secondary published data, and then for the 832 individuals reassessed in the *People and Place* project. In the broader secondary data set, 15% of burials are identified as adult females, 20.5% as adult males, 19.5% as non-adults and 44.7% remain unidentified or unknown in terms of sex (Figure 9). Within our smaller sample set of 832 individuals assessed osteologically, female burials were more visible with 20.8% of adults identified as biologically female, 26.5% as male and 18.6% non adults and the remaining 34.1% indeterminate or unknown (Figure 10).

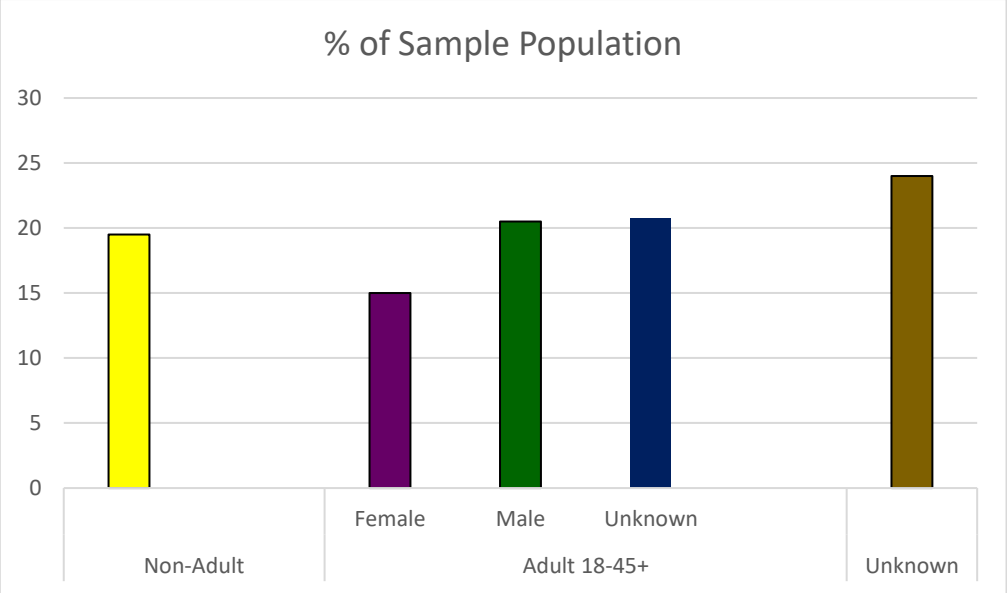


*Figure 9. Sex and age-at-death distribution of all osteological data drawn from secondary published and grey literature data with a focus on adult age categories (n=3562).*

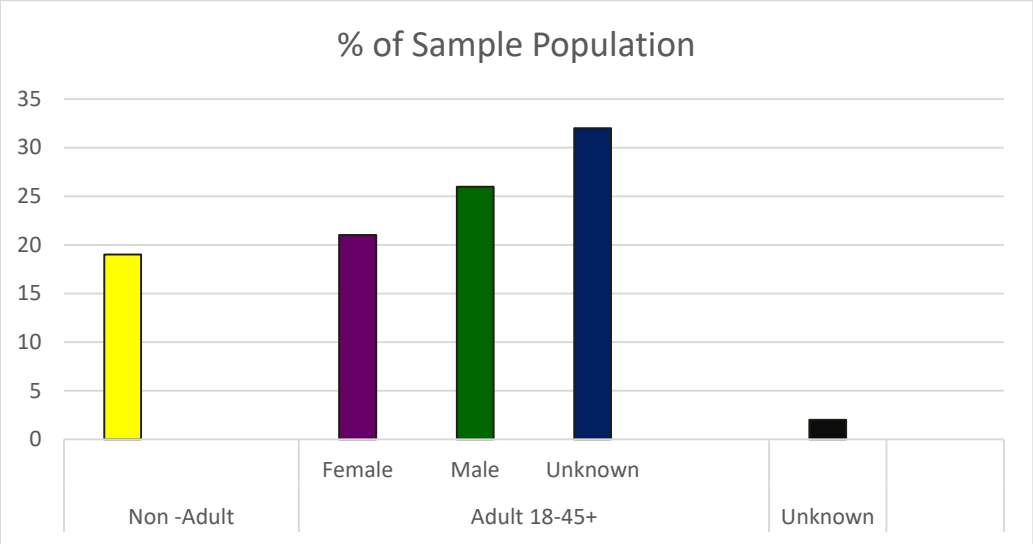


*Figure 10. Sex and age-at-death distribution of the osteological data collected for the People and Place Project with a focus on adult age categories (n=830).*

It is interesting that in this bioarchaeological reassessment, female adult burials contributed a higher percentage of burials in comparison to the secondary dataset. However, imbalance between males and females remains in the visibility, investment and presence of biologically male individuals buried by these communities. Across the north, there are more adult males present in these cemeteries than females, and more adults overall feature in the cemetery populations than non-adults or indeed adults in the 45+ category (Figures 9 and 10).

Currently, we must recognise that there are some limitations in the osteological analysis of skeletal remains: the burial environment and excavation methods, along with intrinsic factors such as the age, sex, and pathological status of the individuals, all impact on the condition of the skeleton. For

example, there are well-known biases against the preservation of older individuals, who may have lower bone density (GOWLAND 2007), or infants, due to the small size of their bones and differential burial practices (e.g. shallower graves) (LEWIS 2007).

Nevertheless, imbalances in the visibility of biologically sexed male and female burials at death (evident in the secondary and primary datasets) raises interesting questions about the demography of the living communities. The numbers of male individuals is higher in these samples in both global terms and across 17 out of 24 of the cemeteries studied. It is possible that men had a greater mortality risk in the 18+ to 45 age range. Women possibly survived into their later years, but in old age their death was not so auspiciously marked in the funerary arena, rendering them less visible archaeologically. In the bioarchaeologically analysed sample, more women are present in the 18 to 25 year category than men. This is commonly attributed to obstetrical hazard, but other mortality risks should also be considered, such as gendered roles or differential access to resources (STONE and WALRATH 2006). Burial practices are known to be structured by age and gender, and this in addition to taphonomic biases can create an uneven representation. A final element worth considering in relation to the demographic profile is the possible impact of migration. While women and children are also mobile, it is argued by some that it is more common for younger men to move for economic or social reasons. This could skew the demography of the living population towards males and create a mortality profile that is similarly biased, given that migrants are often at greater risk of morbidity and death (REDFERN et al. 2018). This latter point will be addressed in our future analysis, which integrates isotopic evidence for mobility with the osteological analysis.

Pathological information from the skeleton can yield crucial information regarding social inequalities and the impact on health in the past. A wide-ranging and seminal study by Charlotte Roberts and Margaret Cox published in 2003 on health and disease in Britain from prehistory to the present day provides useful context against which to analyse our current dataset (ROBERTS and COX 2003). In their study, information on health and disease in the early medieval population between *c*. AD 410 to *c*. 1050 was collated from secondary published and unpublished data from 72 cemeteries, incorporating a total of 7122 individuals (2003, 28, Tab 1.2). As Roberts and Cox identify, the early medieval period in Britain is rich in terms of excavated cemetery data, however with regard to inhumation cemeteries, survival of osteological material is variable and dependent on the underlying geology of the burial site (Ibid. 166-167). The emphasis in their study was placed on well-excavated cemeteries with good skeletal survival. As a result, the majority of sites and individuals included in their analysis were located in southern and south-eastern England. Just 13 cemeteries (18%) comprising 1372 individuals (19%) represented communities living north of the Humber. Their overall findings presented very interesting evidence for a population in which health and nutritional stress indicators appeared relatively low in comparison to other periods. Skeletal evidence indicated that individuals experienced a variety of stressors (disease, dietary deficiency, etc.) throughout their lives, resulting in the presence of dental enamel defects (non-specific childhood stress), *cribra orbitalia* (an indicator of childhood anaemia) and others (ROBERTS and COX 2003, 185). Extreme regional variation was apparent, however, for example, *cribra orbitalia* had an overall prevalence of 5.7% but at the site of Raunds Furnells in Northamptonshire as many as 55%of individuals (46) demonstrated this pathology (LEWIS 1999). In response to such stark variation, we need to take a nuanced, socio-ecological view of indicators of skeletal pathology in early medieval England. For example, the high prevalence of *cribra orbitalia* in some wetland sites (e.g. Littleport, near Ely), has been linked to endemic vivax malaria (GOWLAND and WESTERN 2012).This highlights the importance of a consideration of 'local biologies' (LOCK 1993) and the complex interplay of cultural, historical, ecological and intergenerational factors that impacted on early medieval bodies.

In our reanalysis of a total sample of the 832 individuals from 24 archaeological sites dating to this period from across Northumbria, we assessed various skeletal indicators to estimate the age, sex, stature, and presence of stress and disease in these past populations. Our data presented a number of interesting contrasts with the general overview provided by Roberts and Cox (2003) (Table 2). With regards to maxillary sinusitis, *cribra orbitalia*, and dental enamel hypoplasia, our analysis of the north demonstrates higher prevalences than Roberts and Cox's (2003) results from mostly southern and eastern archaeological sites. Fewer individuals in our sample demonstrate dental caries and ante mortem tooth loss. It is also interesting to note the differences in the range and means of stature between the two studies. A greater range in stature estimations can be seen in our sample than in Roberts and Cox (2003), which could be attributed to the greater resolution achieved here through the use of population formulae specifically created for this time period (WALTHER 2017), rather than the generalised stature formulae produced by Trotter and Gleser (1952; 1958), which is more commonly used.

| Diseases and pathologies | Roberts and Cox (2003) | *People and Place* Palaeopathological Analysis |
|---|---|---|
| Sinusitis | 4.7% (CPR)* | 9.5% (CPR) * |
| *cribra orbitalia* | 24.6% (TPR)† | 35.5%(TPR)† |
| Enamel Hypoplasia | 7.4% (TPR)† | 16.3% (TPR)† |
| Dental Caries | 4.2% (TPR)† | 3.6% (TPR)† |
| AMTL | 8.0% (TPR)† | 3.7% (TPR)† |
| Dental Calculus | 39.2% (TPR)† | 40.4% (TPR)† |
| Metabolic Disease | Not analysed for the period | 10.0% (CPR)* |
| Male Stature | 170-182 cm range; mean=172cm (n=996) | 152.9-182.7 cm range; mean=168.9 (n=67) |
| Female Stature | 152-170 cm range; mean=161cm (n=751) | 143.4-168.6 cm range; mean=159.6 cm (n=49) |

*CPR is the crude prevalence rate of each disease. It is calculated by dividing the number of individuals demonstrating the pathology by the total number of individuals analysed in the sample.
†TPR is the true prevalence rate of each pathology. It is calculated by dividing the number of individuals demonstrating the pathology by the number of individuals with those specific skeletal elements present, not by individual.

*Table 2. Prevalence rates for disease and pathology for early medieval populations reported by Roberts and Cox for largely southern populations compared to those captured by reanalysis and study of the palaeopathology of the skeletal remains of 832 indviduals from central and northern Britain from within the extent of the early kingdom of Northumbria.*

Evidence is beginning to suggest that the lives of people living in the fifth to eighth centuries in central and northern Britain were more challenging overall than in the south. We can disaggregate our data to examine both regional and site-based trends, which offer nuance and reveal more in-depth insights. This paper does not seek to unpack and analyse the full extent of our bioarchaeological data, but it does begin to reveal the impacts of including bioarchaeological data within a census-based exploration of early medieval populations. Further, detailed analysis of the palaeopathological, demographic, isotopic and funerary evidence will provide essential osteobiographical and population level information to interpret the lives and deaths of those living in central to northern Britain during this period.

## A Case Study at Mill Lane, Norton, North Yorkshire: bioarchaeological and isotopic investigation

The early medieval cemetery at Norton, Cleveland, excavated in the 1980s, represents an almost complete cemetery of 120 graves (SHERLOCK and WELCH 1992). The date range, based on the objects found in furnished graves, spans the last half of the sixth century, extending into the seventh (Ibid.). The human remains and population demography were discussed in a dedicated section of the report by Mandy Marlow (1992, 107-118) who concluded that while early deaths in the community might well reflect a hard subsistence economy, they did not demonstrate significant signs of ill-health or malnutrition (1992, 118). Diagnostic techniques and osteological methods have developed considerably over the last three decades and we can now build on this study with much more detailed demographic and pathological information. The excavations revealed 120 graves, including several multiple burials, yielding a total of 134 individuals. There was an unusually high number of non-adults and very few individuals within the oldest age category (only 2.2% of sample), (Figure 11). Within the total sample there are slightly more females present than males (37.8% vs 30.5%, respectively), however for a large proportion of adults (31.7%) preservation was not sufficient for sex estimation.

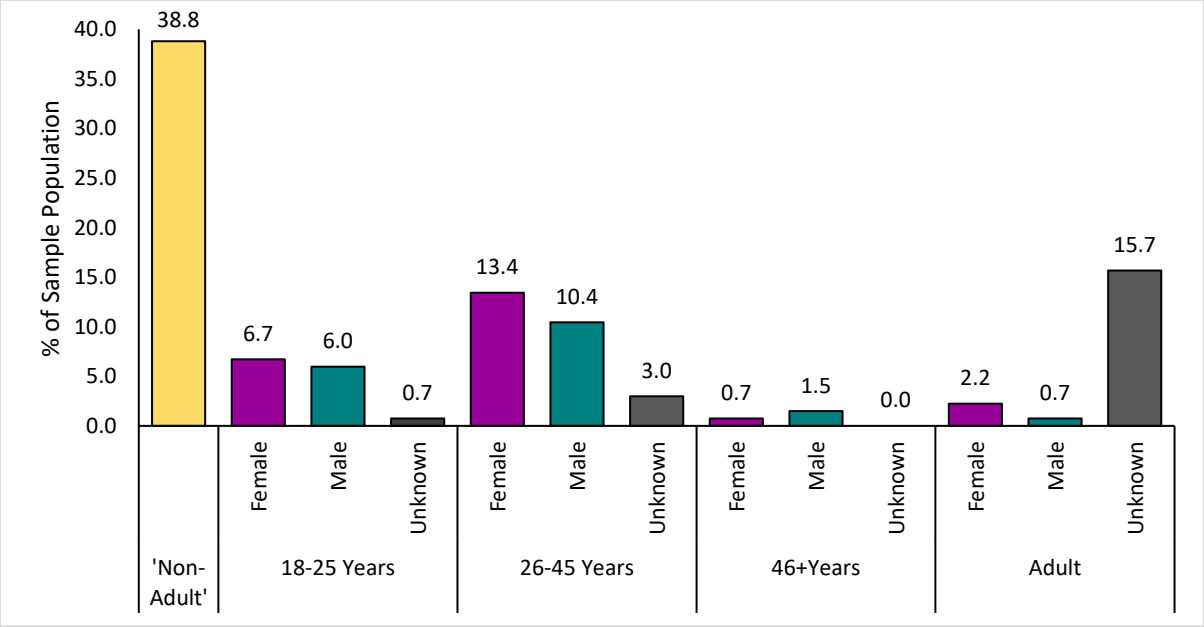


*Figure 11. Population demographic for Mill Lane Cemetery, Norton, Cleveland, Yorkshire (n=134).*

Overall, males demonstrated a significantly greater prevalence rates of *cribra orbitalia* than females (Table 3). Evidence of *cribra orbitalia* usually indicates stress experienced during childhood development and very high levels are observed in the non-adults. The seeming lack of this pathology in the female population at Mill Lane could indicate that females were able to either cope with the stress during development or succumbed to it at younger ages, or were even perhaps were less exposed to those factors that resulted in this condition compared to males. Perhaps a proportion of the females were not local to the environment in which they were buried and their childhood was spent in a locale that was less conducive to the development of *cribra orbitalia*. Other metabolic conditions were, however, more frequent amongst females than males. Overall, one in ten demonstrated some type of skeletal changes associated with metabolic disease (bowing of long bones for vitamin D deficiency and skeletal changes indicative of vitamin C deficiency) (Table 3).

Females with residual rickets (indicative of childhood vitamin D deficiency) also seemed to have died at younger ages (none survived beyond the age of 30 years). Childhood adversity is known to have life-long consequences for morbidity and mortality (BARKER 2012). It is possible that the high prevalence of skeletal indicators of childhood stress within the sample is a significant factor for the lack of individuals over the age of 45 years.

| Biological sex and age | *Cribra Orbitalia*[†] | Maxillary Sinusitis[*] | Dental Enamel Hypoplasia[†] | Dental Caries[†] | Dental Calculus[†] | Antemortem Tooth Loss (AMTL) [*] | Metabolic Disease[*] |
|---|---|---|---|---|---|---|---|
| Males | 23.5% | 16.0% | 33.0% | 3.1% | 44.1% | 16.0% | 12.0% |
| Females | 9.1% | 16.1% | 30.9% | 3.7% | 45.9% | 16.1% | 22.6% |
| Non-Adults (<18 yrs) | 58.8% | 3.8% | 43.9% | 0.3% | 34.8% | 0.0% | 5.8% |
| Total | 27.6% | 8.2% | 34.5% | 2.4% | 40.7% | 6.7% | 9.7% |
| [*]Crude prevalence rates (CPR) reported.<br>[†]True prevalence rates (TPR) reported in order to be compared with Roberts and Cox (2003) data | | | | | | | |

*Table 3. Prevalence rates for disease and pathologies by biological sex and age in the populations studied within central and northern Britain within the broad region defined as the early kingdom of Northumbria (n=832).*

Along with a higher prevalence of metabolic disease, females demonstrated varying amounts of calculus (mineralised plaque) on their dentition compared to their male counterparts (64.5% vs 60.0%, respectively) (Table 3). The mean stature for males in this sample was 172.6cm (n=10) and 157.5cm for females (n=15). The level of sexual dimorphism in stature between males and females is greater than usual and there may be a number of contributing factors for this, but the sample size is not sufficient to draw any firm conclusions.

The overarching picture of life in this community at Norton is one of substantial hardship, both in childhood and adulthood. A mortality peak at *c*. 15 years is identified in the original report (MARLOW 1992, 110-12, Tab 15) and this is unusual, with most childhood deaths occurring below the age of 5 years when the immune system is less well developed. Nutritional pressures seem to be prevalent and indicative of a community that regularly experienced food scarcity, especially when compared to data recorded from Roberts and Cox (2003). The demographic range implies that low numbers of individuals were surviving to old age, corroborating the initial study of human remains which pointed to early adult mortality at Norton and thus perhaps lower life expectancy. The size of the living population served by this cemetery was placed at c. 28 individuals (SHERLOCK and WELCH 1992). There are clearly peaks in terms of the risk of mortality in the lifecycles of these individuals, and the evidence for all round health and wellbeing suggests they led exceptionally challenging lives. This contrasts with the picture of early medieval life that is provided in Roberts and Cox's study, which suggests relatively well-fed and healthy lives (2003, 220). Here at Norton too, there appear to be intra-community inequities of experience; although the life course of these individuals appears to have contained significant hardships, men and women experienced those hardships differently within different age ranges. Further exploration of these patterns through the use of dietary and mobility isotopes should help us interpret these patterns more clearly in terms of gendered biographies. The findings emphasise the broader picture, that for central and northern British communities life may have been challenging and relatively short and that different groups within these communities might experience these hardships differently. Structural inequalities relating to gender, status and age may be especially evident in the bodies of those who lived in marginal environments, as evidenced through differential patterns of growth, health and life expectancy.

Any census relies on collating individual information to allow global to local analysis of social and health trends. The demographic approach has been shown here to work at nested scales of enquiry, teasing out multiple layers of information about the variety of experience and praxis evident within regions and communities. Just as a documentary census or inventory can provide a global snapshot of age, life expectancy and then mine down to individual information on households, place of birth, illness and wealth; cemeteries and the graves in them offer a chance to access the unique lives of individuals that made up the demographic profile of these buried communities. Another facet of the *People and Place* project work has been to conduct analyses of some 120 individuals for carbon, Nitrogen, Oxygen and Strontium isotopes to explore dietary indicators and evidence for childhood mobility. The broader picture around diet and mobility will be discussed in forthcoming papers, but here we use it to show how we can develop an understanding of biography and identity at an individual level.

At Norton, two superimposed inhumation burials were recovered in Graves 98 and 99. The lower inhumation (99) was placed in a prone position, face down with the legs bent double and the arms extended south of the skull. The individual was found with a double-sided, simply decorated and metal-riveted bone comb and two potsherds. The original investigators identified this as a female burial aged 17-25. The excavators suggested the position of the hands and legs in the prone burial might indicate the individual had been bound at death. Above this, to the east side of the grave on a shelf, was a second individual, the burial of a male adult, in a crouched position with the head to the south and the left arm across the chest. Although identified in the original report as a male individual, the excavators characterised this as a female burial based upon the few grave goods, which included an annular brooch, an iron pin with adhering mineralised textiles and a curved strip of copper alloy.

We can now add to the story of these superimposed inhumation burials. Burial 99, identified as a female between 18 and 25 years of age at death, demonstrated multiple pathologies throughout their skeleton. Surprisingly, her stature (163.3 cm ±1.48cm), is taller than the average female stature for the site (157.5 cm ±1.48cm). Evidence of healed maxillary sinusitis was present that could indicate this woman had suffered acute sinusitis, potentially related to working in smoky environments around the hearth or related to industrial activities. They also presented with bone growth on both the endocranial and ectocranial surfaces. These growths appeared healed and indicate that a non-specific infection was experienced at some point during life. Similarly, non-specific indicators of infection were found on both femora and the right tibia and fibula (lower limb of leg). Because numerous infections or trauma can cause these types of changes to the bone, the exact cause cannot be definitely determined. This individual also possessed lower limbs that indicate residual rickets), with bowing of the femora anteriorly and medially bowing of the tibiae and fibulae. While the bowing would not have been visible under her clothing, it is possible that it would have led to a distinctive gait during life. A greater number of porosities can be seen throughout the skeleton, which indicate an increase in vascularisation linked again to healing responses within the body. This woman, buried with a relatively coarsely made, but decorated comb, had a short life by comparison to modern life expectancy and a life that was hard and made so by dietary deficiencies in child and adulthood, alongside stresses that seem to have created multiple infections. Isotopic evidence identifies this woman as non-local, with strontium ratios that are too high for the local bedrock geology of the site. Like the strontium isotope ratio, the oxygen isotope ratio is high for the east coast of Britain, but is within the local range of Britain and Ireland. These ratios are more likely to be found in individuals originating from the western parts of mainland Britain. It is possible such higher oxygen isotope ratios could result from cultural modifications of the water, such as brewing and stewing (BRETTELL et al., 2012). However overall, it seems likely this female and two others assessed as part of the project's bioarchaeological reassessment of this cemetery spent the early part of their lives in western Britain.

We can speculate about what role this individual had at Norton and why and how they travelled at some point in their life from western to eastern mainland Britain, but the bioarchaeological assessment clearly reveals that even in the context of the poor health of the buried community at Norton, this individual had experienced an unequal existence in terms of nutrition, infection and health in comparison to others in that population. She was also treated differently in death in the grave, yet she had lived with and was buried with the Norton community.

Just as a modern census captures both the global demographic picture in terms of age, gender, mobility and health, and also captures individual insights valuable to understanding the social inequalities and pressures of modern life, so our funerary census for early medieval Britain can model global trends in the buried population and demographics, and reveal the nuance of individual experience. Like other women in this small community of *c.* 28 or so buried individuals, the woman in grave 99 seems to have struggled to access regular nutrition, and her overall osteobiographical profile points to having lived a marginalised life with other signs of deprivation throughout her 20-odd years of existence.

## Conclusions

Between the online dataset of *Prosopography of Anglo-Saxon England* that lists all the recorded inhabitants of England from the late sixth to the late eleventh century and the text volumes of the *Prosopography of the Later Roman Empire*, which gives a complete secular biographical dictionary for the period AD 260 to 641, there is an enormous gap embodied by the population of mainland Britain outside of the elite level. The combined data sets of the *Beyond the Tribal Hidage* project and the *People and Place of Northumbria* project have begun to fill this gap.

The digitisation of burials opens more opportunities for comparative analysis and thus for exploring the multi-layered complexity of these populations in death and life. Using these data, we can quantify and analyse burial practices using all the traditional approaches that emphasise goods, metalwork and grave-furniture, yet we can also record and analyse nuances in data in other ways. We have sought here to compare the innate aspects of burying the dead that still represent human investment: the size of graves, the amount of empty space and the categories of the burial persona. These aspects point to regional variations and distinct traditions relevant to central, northern and southern Britain. The age and sex composition of cemeteries also provides an insight into the composition of living communities and how different groups were invested in variably at death and perhaps in life as well. Bioarchaeological and isotopic data, is underlining a very different kind of existence in early medieval northern and central British populations from those in southern Britain, and even at an intra-site level, some people were experiencing greater inequities in health and their treatment in life and at death than others. These different demographic scales of approach we argue have a new depth of capacity for informing us about localised and regional trends in the ways communities lived and dealt with the dead.

Taking the multiple strands presented above, with unique combinations of old data, digital analyses, scientific advances, and experience of working with these methods, a new expansive refined methodological approach of the study of early medieval populations may be possible. In doing so we will chart macro-scale trends and we can also begin to experience the lives and deaths of regional populations, individual communities and explore single and multiple biographies too. The combined datasets of the *Beyond the Tribal Hidage* project and the *People and Place* project are uniquely positioned to support this kind of nuanced and holistic exploration of life and death in the first millennium AD.

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[i] For example, Martin Welch in 2009 Maastricht on 'The archaeological evidence for state formation in southern England: a comparison of the early kingdoms of Kent, Sussex and Wessex', Sarah Semple in 2016 Antwerp on 'Creating Kingdoms: Burials, Waterways and Inland Communications in North East England AD 300-800' and Sue Harrington in 2017 Canterbury 'Kentish and Continental material in Northumbria'.

[ii] This section draws substantively on a recent publicatoin by the *People and Place* team in the *Cambridge Journal of Archaeology.* We summarise some of the results here and republish a number of analytical illustrations published with the original article (see Harrington et al. 2019).

[iii] A pilot study based on Scorton, West Heslerton and Sewerby (Yorkshire), Castledyke South (Lincolnshire), Butler's Field Lechlade (Gloucestershire), Market Lavington (Wiltshire), Mill Hill, Deal (Kent).