Chapter 10: Alloparenting Adolescents: Evaluating the Social and Biological Impacts of Leprosy on Young People in Saxo-Norman England (9th – 12th centuries AD) through Cross-Disciplinary Models of Care.

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Figure X. *Impaired child being moved by cart and receiving charity. From The Luttrell Psalter, British Library MS Add MS 42130 fol. I86v.*

Introduction

The majority of historical sources describe past attitudes towards people with leprosy as negative, focussing on ostracism and damnation, and this is thought to have impacted on the care that

sufferers received. More recent historical and archaeological evidence challenges this longstanding perspective, portraying a very different view of care for those with this potentially debilitating and disfiguring disease (Roberts 2002; Rawcliffe 2006; Roberts 2013; Roberts 2018).

This paper aims to explore the social and biological impacts of adolescents with leprosy in Saxo-Norman England (9^{th} – 12^{th} centuries AD). The intersection of youth, chronic infection, aspects of care (inclusive of medical, surgical, and daily support), and cultural identity has only been tangentially explored in the past (e.g see Redfern and Gowland 2011; Roberts and Bernard 2015; Lewis 2017). Studies that integrate these entwined themes can, however, provide a more holistic view of societal responses to wider encultured disease identities.

This study utilises multiple lines of evidence for medical care and social treatment to evaluate the validity of dominant historical narratives about leprosy, i.e. that people in the past with leprosy were not cared for or treated well. In order to achieve this, the notion of past requirements of care and treatment through an alloparental model will be introduced. This is followed by a review of the existing historiographical evidence for medical care for young people in the medieval period to better understand systems of care provision and parental reactions to their sick children at this time. Discussions of leprosy in young people in the present and past will help contribute to longitudinal views of the biological impacts of leprosy and help the necessity for care in relation to certain pathological responses (i.e. the manifestation of lepromatous leprosy). To apply this framework to the past, palaeopathological and archaeological evidence from adolescent individuals excavated from the North Cemetery of St. Mary Magdalen leprosy hospital will be analysed. The presence of both leprosy and alloparental care for adolescents in the Saxo-Norman transition at this hospital is demonstrated. Finally, the construction of a theoretical model of required clinical care and provisions, such as the Index of Care framework, helps interpret the evidence for care in alloparental institutions such as leprosaria.

The treatment of people with leprosy in the medieval period is often cited as a justification for the continuing stigma and community expulsion of family members with leprosy in some parts of the world (World Health Organization 2015). Therefore, it is worth examining the social milieu of this disease in which young people with leprosy in the past lived, and the models of care and treatment that may be interpreted from these data in order to dispel this longstanding stigma.

A Note About Terminology

This research considered a variety of sources for determining the biological and social age ranges for adolescence, including:

1. the early medieval (5^{th} – 11^{th} centuries AD) social classifications of youth (e.g. i.e. *puerita*: 7 - 14, and *adolescentia*: 14 – 28)(Sharpe and Seville 1964:49; Gilchrist 2012:34; Cochelin 2013:3-6);
2. the age that a person was considered an 'independent adult' in the lay population of the medieval period in England (i.e. 25 years; Cochelin 2013; Lewis 2016:139);
3. and modern biological definitions of adolescence (10-25 years; Patton et al. 2016; Sawyer et al. 2018).

With these definitions in mind, individuals aged c. 10 -25 years at death were included in this paper to encompass both the biological and medieval social designations of adolescence. Other broad social terms such as 'young' and 'youth' are used interchangeably with adolescents as they are

versatilely applied within the cultural understandings of the medieval life course (Gilchrist 2012: 1-11, 34-35; Mays et al. 2017).

Considering the Role of Alloparenting in the Leprosarium

Since the publication of the contentious work *Centuries of Childhood* by Ariès (1962), many scholars have pushed an agenda for and against the assertion that "in medieval society, the idea of childhood did not exist" (128). This has inspired a broad range of studies within both history and archaeology to reassert the visible and tangible concepts of youth in the past, along with the provision of care for children (Demaitre 1977; Kroll 1977; Kroll and Bachrach 1986, Lewis 2016; Dawson 2017; Lewis 2017). One aspect that has not been thoroughly investigated, however, is the perception of the sick child, and the provision of care and associated medical/surgical treatment under an alloparental umbrella within an institutional setting.

Alloparenting is defined as the provision of care for young individuals by persons other than their biological parents (Kenkel et al. 2016). The practice of alloparenting is a cultural universal in both the human and many animal species, and remains an important aspect of caregiving in modern societies (Sear and Mace 2008; Kenkel et al. 2016). Most studies focus on models of alloparenting in breastfeeding, infancy studies, maternal bonding, kinship attachment, nursery/pre-school settings, and schools (Ahnert 2005; Quinlan and Quinlan 2008; Sear and Mace 2008; Bogin et al. 2014), and very few studies examine the effects of long-term healthcare provision in an alloparental institution; i.e. in hospitals for chronically ill children (Youngblut 1999; Zaslow 2006). This may be, in part, due to modern systems by which parents remain involved in limited periods of care during a child's convalescence. Despite this, some modern studies have highlighted that young people receiving care and treatment (in both medical and guardianship contexts) from alloparents and alloparental institutions report a similar quality of life, level of happiness, and health outcomes to those within comparable biological parental units (Lloyd 2012; Kenkel et al. 2016).

In view of this, it is worth considering the alloparental model for medieval monastic hospitals, including leprosaria such as the St. Mary Magdalen leprosy hospital in Winchester, Hampshire, UK. For example, the discovery of a relatively large number of adolescents (n=23) linked to this leprosy hospital context raises questions concerning who was providing these young people care and the nature of the care received. Writings about the presence and status of adolescents within monastic contexts mainly centre on young people who were given to the monastery, termed oblates (literally meaning "the ones offered"), and their treatment as adoptive and communal family members in both sickness and health (Cochelin 2020:550-553). However, the provision of care and treatment of adolescents within linked monastic contexts such as medieval leprosy hospitals is poorly documented. It is therefore worth exploring the evidence for medical care for children in the medieval period to help construct more holistic views of how young people with leprosy would have been treated within these institutions by their caregivers, or alloparents.

Medical Care for Medieval Children – An Index of Effort

In order to determine whether care and treatment for leprosy (medical and spiritual), as opposed to expulsion, would be a motive for a young person's entry into a leprosarium, we must first assess whether parents sought medical care for their sick children from monastic institutions. Medical provisions, including palliative and interventional care, for sick children in the past are not a large

focus in medico-historical writings, which has led to assumptions that physicians from antiquity to the medieval period did not offer these options for younger patients (Demaitre 1977; Kroll 1977; Kroll and Bachrach 1986; Gordon 1991). This long-standing belief is partially due to the paucity of historical documents detailing the lives of sick children, thereby inferring that they were not important. Common medical practice in the medieval period was heavily reliant on home-based, folk-medicine; i.e. at-home treatments focussing on local herbal remedies, hygiene, and dietary corrections (Demaitre 1977; Kroll and Bachrach 1986; Newman 2007:71-72). Only in serious circumstances (e.g. chronic infections, plague, dysentery, severe trauma, paralysis, blindness, etc.) were children taken by their parents to physicians or monastic hospitals (Kroll 1977; Kroll and Bachrach 1986; Gordon 1991; Rawcliffe 2006:291-292; Newman 2007:38,41,71-72).

Monastic physicians during this period wrote of their difficulties in diagnosing and treating children, complaining that the young could not adequately vocalise their symptoms and that the conventional diagnostic methods of the time (e.g. taking the pulse and uroscopy – observing the urine) were effectively useless due to a lack of knowledge about childhood conditions (Demaitre 1977). For this reason, early medieval physicians and hospital facilities explicitly limited themselves to the treatment of childhood diseases only after parental medical care options were exhausted (Demaitre 1977; Kroll and Bachrach 1986; Gordon 1991). Kroll and Bachrach (1986) conducted a review of historical references from the early medieval period in Europe (pre-1100), revealing 64 of 371 instances in which parents brought their sick children to monastic sites or shrines, sometimes involving upwards of several hundred kilometres travel (*ibid*). Both direct costs for transport (e.g. draft animals, cart, food for the journey), labour loss, and subsequent donations/payments to hospitals in the form of money, land, animals, the children themselves, etc., and indirect costs (e.g. anxiety, stress) involved in the process were analysed (Figure X; Demaitre 1977; Kroll 1977; Kroll and Bachrach 1986; Gordon 1991). This study found no significant difference in the social class (nobility, townspeople, and peasants) of the children brought to monastic institutions for medical provision, suggesting that such care was accessible to all children brought by their parents. Boys, however, were brought to receive medical attention 1.4 times more than girls. This does not necessarily mean that girls were not valued as much as boys as sex-linked frailty also seemed to be significant factor, with 87.5% of the child and adolescent deaths from illness occurring in boys (*ibid*).

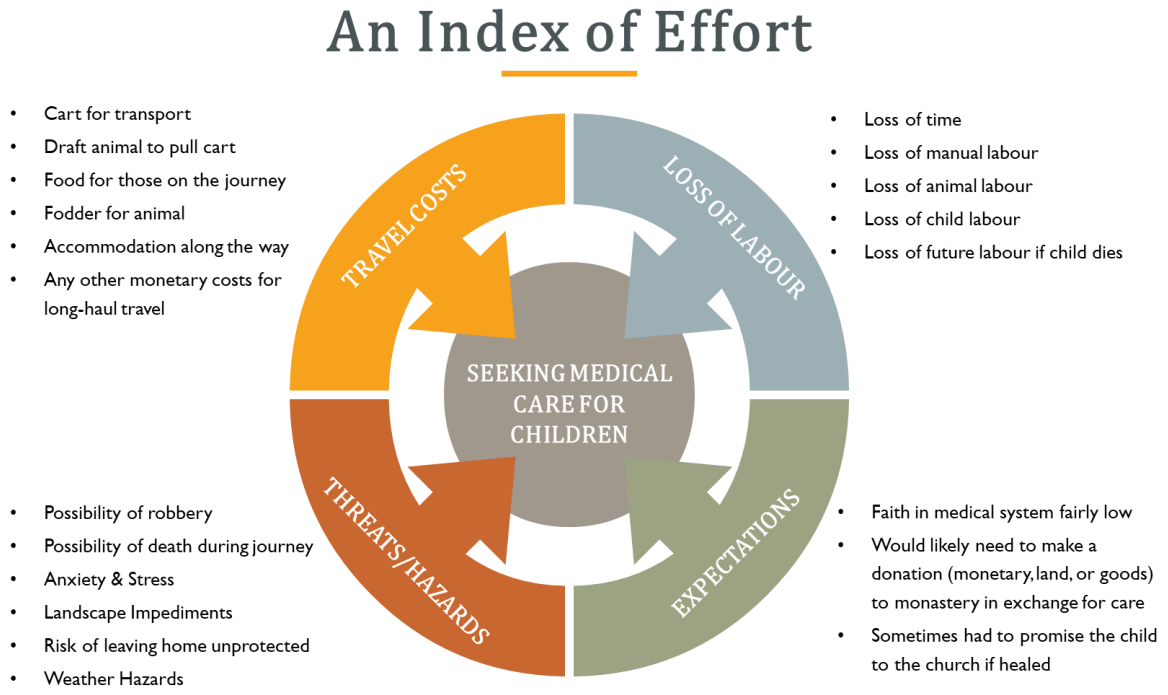

Figure X. Direct and indirect costs involved with seeking medical or surgical care for children in the early medieval period (after Demaitre 1977; Kroll and Bachrach 1986; Gordon 1991; Rawcliffe 2006).

Medieval Leprosaria- Care or Confinement?

Evidence embedded in the recorded lives of saints, homilies, and other ecclesiastical documents indicate the lengths parents went to secure treatment for their children, but do not discuss many details of the nature of this care. Both documentary and archaeological evidence for daily life within leprosy hospitals is scarce, and most previous research has relied upon syntheses of geographically and chronologically broad and anecdotal data sets, leading to interpretations that these institutions were neglectful communes for expelled and unwanted individuals on the fringes of society, with negligible care after admittance (Brody 1975: 68-75; Richards 2000: 48-53; Orme and Webster 1995: 24-31). However, this is at odds with the *Rule of St. Benedict* – the primary operational framework for monastic hospitals and leprosaria in England from the mid-10th century AD.

From 964 AD, major Benedictine reforms codified by Bishop Aethelwold of Winchester required all monastic institutions to operate under the *Rule of St. Benedict*, mandating they establish an infirmary and place the care of children and elderly above and before all else, especially with regard to adequate provisions (beds, warmth, clothing, baths, etc.) and a balanced diet (Orme and Webster 1995: 17-23; Clarke 1931:57-58; Rawcliffe 2006: 322-377; Roffey 2012). The implementation of the *Rule* also extended to monastic leprosaria (Rawcliffe 2006: 322-337; Roffey 2012), and references within the *Rule's* chapters reveal particulars about the admittance and long-term care for young people within the leprosarium. For example, Chapter 59 details the process for transferring young people into a monastic institution (i.e. oblation), specifying that parents were obliged to offer their children in person and sign a parental contract for transfer, which may have taken significant effort with direct and indirect costs (Clark 1931: 86-88; Kroll 1977; Demaitre 1977; see above). Additionally, Rawcliffe (2006) cites several examples of wealthy parents (e.g. Brian de Insula, Elinald of Clare) specifically (and very publicly) founding leprosaria for the admission and care for their infected children, as well as the desperation of parents to ensure their beloved children were given a

space within a medieval leprosarium after home-care solutions were exhausted (130-131, 292-293). These accounts imply that parents were concerned about the well-being and care for their leprous children, and were not seeking their admittance into a leprosaria as a means of familial expulsion.

Chapter 36 in the *Rule of St. Benedict* specifically directs monasteries to welcome and treat the sick with the same care and compassion as they would treat Christ, and to give them special allowances with regard to normally prescribed bathing and food routines; i.e. feeding them meat instead of fish, and not fasting if they are seriously ill (Clarke 1931:56-57). In Chapter 37, this regulation is further extended to oblates stating, "on no account let the strictness of the *Rule* in respect to food (i.e. fasting and prescribed monastic diets) be held to as regards [young people], but let there be gentle consideration exercised in their case and let them anticipate the regular hours for meals (Clarke 1931: 58)." The *Rule* also mandated that young people and the infirm have a special caregiver (i.e. alloparent) to oversee their needs within the institution (Clarke 1931:51-52; Orme and Webster 1995:17). Although it is not possible to ascertain the extent to which the *Rule* was strictly adhered to, there is no reason to doubt that these components would have been part of a leprosarium's operational framework. Rawcliffe (2006) extensively makes the case for English leprosaria as beneficial places to be for those with leprosy, and underscores the level of social and cultural support required to maintain these institutions. Leprosaria and people with leprosy were highly favoured beneficiaries of kings, queens, noblemen, bishops, and abbots, who paid patronage in the forms of monetary compensation, donations of food, land, and palliative care (e.g. publicly washing feet and cleaning sores)(*ibid*: 302-314). People with leprosy were venerated as holy penitents, and, in return for a benefactor's patronage, daily prayers were offered by the leprosarium to secure the benefactor's place in heaven (Roberts 1986; Rawcliffe 2006: 322-377). Further, in the post-conquest period (1066 AD onwards), Huggon (2018) estimates approximately 1100 hospitals operated in England and Wales, with approximately one-third functioning as leprosaria, which either suggests a major public health crisis, and/or lends support that leprosaria were not unpleasant places, offering some stability and protection during major cultural and political transitions. Beyond these examples, specifics regarding individual levels of care with a leprosarium are absent, so in order to assess the types of care required for individuals with leprosy, we must explore the biological impacts of the disease.

Leprosy in Young People – Present and Past

Leprosy, also known clinically as Hansen's Disease or more recently, Mycobacterial neurodermatosis (Bultin and Lockwood 2020), is a bacterial infection caused by either *Mycobacterium leprae* or *Mycobacterium lepromatosis*. Clinically, leprosy is a disease of the peripheral nervous system, affecting the skin, extremities, vocal and respiratory tracts, mucous membranes, eyes, and kidneys (Walker and Lockwood 2006). Once a person is infected, the mycobacterium multiplies slowly, leading to a long incubation period ranging from one to twenty years (World Health Organisation 2019). The 'type' of leprosy a person develops manifests is encompassed within a broad immune spectrum, ranging from the highly resistant paucibacillary or tuberculoid form to the low resistant multibacillary or lepromatous form (Walker and Lockwood 2006; Lastoria and Abreu 2014). Leprosy has a long biological and social history, and today can be associated with stigma and isolation in endemic areas. Although notions of leprosy invoke anachronistic images of medieval Europe, the disease is still very much part of the infectious landscape with approximately 200,000 new people diagnosed with leprosy in 2018 (World Health Organization 2019).

Leprosy can affect individuals of all ages, but leprosy in younger people is considered rare, likely due to the lengthy incubation periods associated with the manifestation of the disease. Since 2005 the proportion of children (<18) infected with leprosy out of the total infected population is between 9-

35.5% (Butlin and Withington 2018). In comparison to adults, children are at increased risk of developing the more severe, lepromatous form of leprosy and subsequent permanent disabilities, with some infected communities showing 80.5% of children displaying multibacillary signs and symptoms (*ibid*). Although the incidence rates of leprosy diagnoses in children have halved from 2005-15 (407,791 to 210,740), issues with delayed diagnosis, inadequate nutrition, immunodeficiencies, and endocrine system disruption as a consequence of puberty, complicate elimination efforts (Davey and Schenck 1964; John et al. 2005; Butlin and Withington 2018). In these endemic communities where leprosy notably affects children, treatment, monitoring, and de-stigmatisation are of utmost importance for familial, community, and hospital care networks (Butlin and Withington 2018). Although leprosy and subsequent care is readily documented for children today, historical and archaeological evidence of leprosy in young people is much more scant due to a lack of detailed sources and archaeological contexts.

Identifying Leprosy in the Past

In current popular mind-sets, the idea of leprosy during the medieval period invokes images of stigma and expulsion. However, the assumption of a widespread hostility towards people with leprosy in the past is primarily anecdotal, and largely an artefact of conquest and racism in later colonial years (Rawcliffe 2006:13-29; Edmond 2006:61-109). Aggressively deleterious isolation campaigns led by Albert Ashmead in the late 19th and early 20th centuries led to worldwide legislative changes and helped to solidify an ingrained prejudice against people with leprosy, past and present (Ashmead 1895; 1897a; 1897b; 1897c; 1897d; 1899; 1901a; 1901b). Many sources trace leprosy back to the medical treatises of Hippocrates and Galen, and in stories of moral character found within the Bible (Adams 1868; Browne 1975; Johnston 2006). However, the 'leprosy' described in these and other Classical sources depicts a different condition (e.g. a range of skin diseases such as vitiligo, eczema, psoriasis, and impetigo) to the bacterial infection we now ascribe as leprosy. Some descriptions of the modern-day iteration of leprosy can be found in ancient texts of India and China, and in the Roman Empire in the 1st century AD, prompting some scholars to hypothesize its spread from the East along the Silk Road as a consequence of Roman Trade (Bhishagratna 1963; McLeod and Yates 1981; Mark 2002; Binder 2018). Early Roman (1st century AD) medical scholars described leprosy as a skin condition causing white patches on the skin, and, although today the signs of leprosy often begin with a skin lesion, the ensuing pathogenesis is more like the Roman descriptions of the disease *elephantiasis graecorum* (Demaitre 2007: 86-91). Following the split of the Roman Empire, these Roman medical sources fell out of favour in the West, but continued to develop within the Byzantine Empire in the East. Empirical Arabian medical practices surpassed Western superstitions as a means of treatment, culminating in a shift of medical thought at the School of Salerno. This primarily occurred when Constantine the African (a North African Benedictine monk and physician) translated Arab texts into Latin in the late 11th century AD (Conrad et al. 1998: 140-141; Demaitre 2007: 86-91; Miller and Nesbitt 2014: 21-22). In the course of these translations, the extreme form of *elephancia* (what we now know as lepromatous leprosy) was translated and named *lepra*, thereby connecting the clinical condition with the moral condition pervasive in medieval thought (Rawcliffe 2006:76; Demaitre 2007:87). Because this nexus occurred in the late 11th - early 12th centuries AD, the importance of understanding leprosy as a social condition in England in the pre-Conquest era is important to gauge a more accurate societal response to the disease.

Bodies of Evidence - Archaeological examples of leprosy in young people

At present, only a handful of archaeological skeletons of young people displaying bone changes of leprosy exist. Isolated reports of leprosy in children and adolescents have been recorded in Scotland

(2280-1970 BC), Italy (2nd – 3rd centuries AD), Turkey (8th – 10th centuries AD), Czechia (9th – 10th centuries AD), in Northern England (10th century AD), Croatia (10th – 11th centuries AD), and Sweden (10th – 12th centuries AD) (Roberts 2007; Mays 2007; Economou et al. 2013; Rubini et al. 2014; Donoghue et al. 2015; Bedic et al. 2019). The inclusion of these young people within the normative cultural and burial practices for the groups associated with these sites may suggest that notions of stigma associated with leprosy were not as commonplace in the past as they are today. In further support of this view, Roberts (2002) surveyed 41 archaeological sites from the Roman to post-medieval periods in Britain that yielded individuals with skeletal lesions consistent with leprosy, and found that 36/41 sites revealed individuals buried within the normal confines of their communities. The remaining five examples were attached to leprosy hospital sites, which tended to produce multiple individuals with leprous bone changes (*ibid*). Although leprosy hospital sites usually of the late medieval period (i.e. post-12th century AD) tend to produce higher numbers of skeletons showing leprosy (e.g. Magilton et al. 2008:11-12, 95), other early medieval contexts that reveal high percentages of individuals with leprosy within normal contexts do exist. For example, Anderson (1998) and Shepherd Popescu (2009) have reported a significant number of skeletons with leprosy (23%), including adolescents, at the Late-Saxon Timberhill site in Norwich, Norfolk, England (980-1050 AD). Communally inclusive burial contexts such as this should be borne in mind when considering the social reactions to young people with leprosy in the past, but in order to assess levels of care and treatment, leprosaria contexts also need to be viewed.

Adolescents in Medieval Leprosaria

Danish physician Møller-Christensen first detailed the bone changes associated with lepromatous leprosy in the human remains excavated from the late medieval (1250-1550 AD) Naestved leprosy hospital site in Sjaelland, Denmark (Møller-Christensen 1961). Møller-Christensen noted that just under 20% of young people with leprosy (<18 years) displayed skeletal lesions indicative of lepromatous leprosy, which he interpreted as evidence of a high degree of endemicity of the disease during this time (Møller-Christensen 1961; 1978). Approximately 20% of all burials from the cemetery of the late medieval St. James and St. Mary Magdalene leprosy hospital (12th – 15th centuries AD) in Chichester, Sussex, England displayed skeletal lesions consistent with leprosy; however, none of the 104 children and adolescents demonstrated any diagnostic bone changes indicative of leprosy (Lewis 2002; Lewis 2008:174-176). This may indicate a change in medical provision by increasing diversity amongst the generally infirm in the later medieval period, rather than remaining a purpose-built institution for people with leprosy. Conversely, it may indicate changes in medical practice and a declining ability to distinguish the clinical signs and symptoms associated with leprosy from other conditions. It is also important to consider the Osteological Paradox (Wood et al. 1992), which acknowledges that not everyone who contracts a disease will manifest skeletal lesions and that individual responses to the disease are complex.
In contrast to St. James and Mary Magdalene, the North Cemetery from the St. Mary Magdalen leprosy hospital (9th – 12th centuries AD) in Winchester (Figure X) reveals the highest prevalence (~86%; 38/44) of individuals displaying signs of lepromatous leprosy from any cemetery or leprosarium site. Within this cemetery were a significant number of adolescents (~58%), most of whom showed diagnostic evidence for lepromatous leprosy (Roffey and Tucker 2012; Table X).

Table X Adolescents excavated from the North Cemetery of the St. Mary Magdalen Leprosarium (c. 9th – 12th centuries AD; Winchester, UK).

INDIVIDUAL	AGE (YEARS)	SEX	BONES AFFECTED BY LEPROSY
SK. 8	9.5-10.5	Male	Facial bones, Hands, Legs

SK. 9	22.5-23.5	Male	Hands, Feet, Legs
SK. 14	16-19	Male?	Facial bones, Hands, Feet, Legs
SK. 15	20.5-22.5	Male	Hands, Feet, Legs
SK. 16	18-25	Male	Facial bones, Feet, Legs
SK. 17	18-25	Female	No leprous changes
SK. 18	14.5-16.5	Male?	Facial bones, Hands, Feet, Legs
SK. 19	c. 25	Male	Facial bones, Hands, Feet, Legs
SK. 21	19-25	Male?	Facial bones, Hands, Feet, Legs
SK. 25	17-19	Male	Facial bones, Hands, Feet, Legs
SK. 26	18-25	Male	Facial bones, Feet, Legs
SK. 27	22.5-23.5	Male	Feet, Legs
SK. 28	13.5-14.5	?	Facial bones, Feet, Legs
SK. 29	18-25	Male	Facial bones, Hands, Feet, Legs
SK. 37	13-16	?	Feet
SK. 38	18-25	Female?	Feet, Legs
SK. 39	18-25	Male	Facial bones, Feet, Legs
SK. 41	13-16	?	Facial bones, Feet, Legs
SK. 45	15.5-16.5	?	Facial bones, Feet, Legs
SK. 46	16-19	Male	Facial bones, Feet, Legs
SK. 52	15.5-16.5	?	Facial bones, Hands, Feet, Legs
SK. 54	13.5-14.5	?	Facial bones, Hands, Feet, Legs
SK. 56	18.5-19.5	Male	Facial bones, Hands, Feet, Legs

The Leprosy Hospital of St. Mary Magdalen (Winchester, UK)

The St. Mary Magdalen leprosy hospital is presently the oldest documented leprosy hospital in Britain. Documentary evidence from the 1148 Winton Domesday reference it was in operation as a leprosarium under Bishop Richard of Illchester, but timber structures that underlie the 12th century masonry and subsequent radiocarbon dates (late-9th to mid-12th centuries AD) indicate earlier establishment and use (Roffey and Tucker 2012; Roffey 2012). Within the site are separate cemeteries that can be associated to particular chronologies; the North Cemetery, which is associated with the pre-12th century AD timber phase, and the South Cemetery, which is associated with the post-12th century AD masonry phase. Despite the clear association with the building phases of the hospital, there is also an archaeological distinction in the burial treatments of individuals between the North and South Cemeteries, which may reveal shifts in cultural attitudes post 12th century AD. Prior to the excavations at St. Mary Magdalen, leprosaria were thought to be a Norman development (Roffey 2012; Roffey 2017), and although the establishment of leprosaria within Britain sharply increase from the 12th century AD (Roberts 1986), the presence of a leprosarium that predates the Norman Conquest is noteworthy.

Handled with Care – The burial contexts

The skeletons excavated from the North Cemetery of St. Mary Magdalen leprosy hospital were very well- preserved and revealed an unusually high prevalence of skeletons with lesions consistent with or diagnostic of lepromatous leprosy (38/44), of which, 58% were adolescents (n=22)(Table X). The majority of those buried in the North Cemetery were interred in single, anthropomorphic graves with westward-facing head niches and earthen pillows (i.e. inner ledges to elevate their heads), with the exception of Sk. 14 (radiocarbon dated cal AD 995-1033) who was buried in a coffin (Roffey and Tucker 2012). The anthropomorphic grave cuts and head niches are normally reserved for high-status ecclesiastical sites and show a considerable degree of care and effort went into creating a

final “resting place” for them (Roffey and Tucker 2012). Some of the graves within the North Cemetery also contained burial goods, which is a relatively rare phenomenon in Christian cemeteries, but does help to highlight social and individual identities. For example, Sk. 27 was buried with a Pilgrim Badge that he presumably obtained from the shrine of St James, in the Santiago de Compostela Monastery in Spain (Roffey et al. 2017), and Sk. 19 was buried with adapted feeding elements (e.g. a modified feeding bowl) associated with the likely difficulties (e.g. loss of hand function due to flexure contractions and resorption; Figure X) this particular individual had with eating, suggesting a level of individualised, palliative care at St. Mary Magdalen (Roffey et al. 2017; Roffey and Tucker 2012).

This care in the burial of individuals with leprosy in the North Cemetery appears to dissipate in the South Cemetery. Here, the burials associated with the 12th century AD masonry phases are on different alignments and comprise more haphazard burial treatments for all individuals (e.g. multiple and truncated burials with no anthropomorphic grave cuts), implying some form of cultural change (Roffey and Tucker 2012). The individuals in the South Cemetery also revealed a lower prevalence rate of lepromatous leprosy (40%) (*ibid*), perhaps indicating that the form of leprosy present during later periods was less-severe (e.g. Tuberculoid leprosy), or that leprosy as a disease was more poorly identified after the Norman Conquest. It may also be a reflection of the decline of leprosy from the 14th century AD onwards, possibly due to the rise of other infectious diseases such as the Black Death and tuberculosis (Manchester and Roberts 1989; Manchester 1991; Roberts 2002; Crespo et al. 2019).

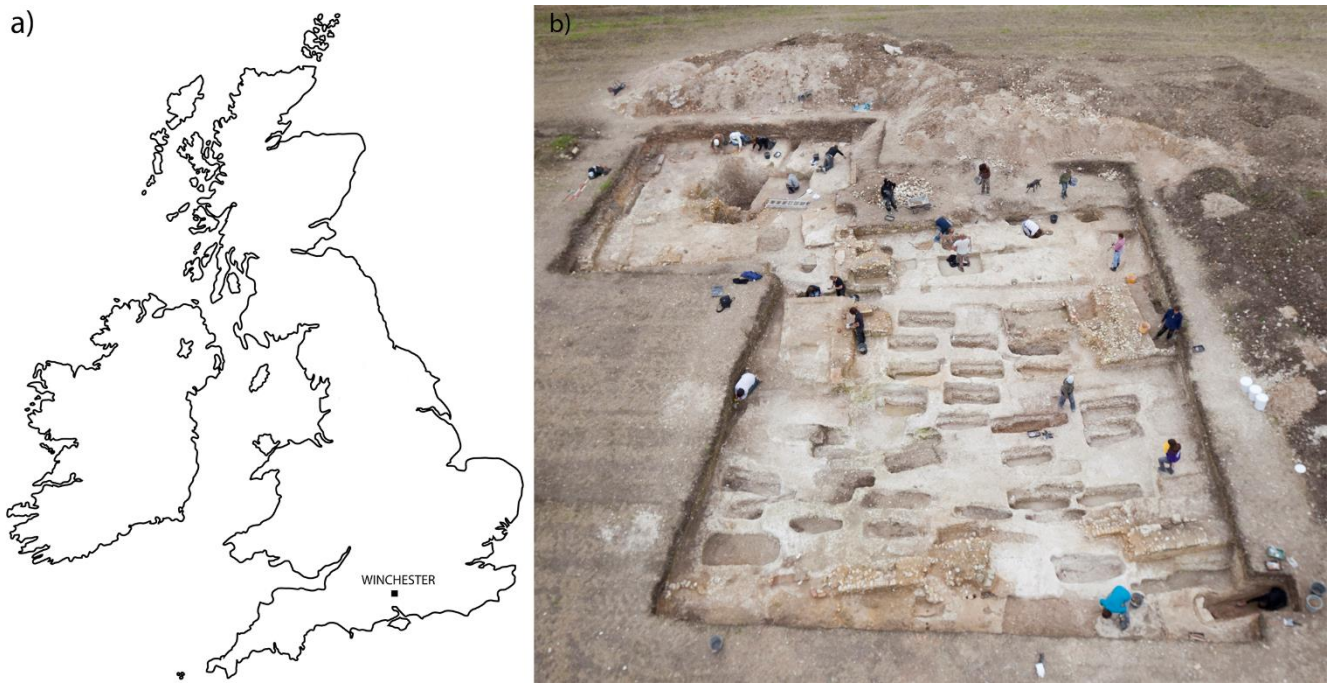

Figure X. a) Location of St. Mary Magdalen Leprosy Hospital (Winchester) and b) aerial view of the excavations of the North Cemetery and parts of the South Cemetery and 12th century AD masonry shown on a different alignment.

Skeletal Indicators of Lepromatous Leprosy in the Adolescents at St. Mary Magdalen

In order to elicit skeletal changes as a consequence of a pathological stimulus, a person must have a disease for long enough before death for the bone changes to occur (Wood et al. 1992). Therefore, when viewing the skeletal indicators of a chronic infection, we must bear in mind that the individual's immune system was strong enough to fight the acute stages of the disease for some time before the hard tissues were affected in the later chronic stages (*ibid*). This associated chronicity of disease implies that the individuals possessed a better health status in order for the inflammatory response associated with immune function to be prolonged. This is especially pertinent when viewing the severe and potentially debilitating bone changes associated with lepromatous leprosy. Many of the skeletal lesions present in the child and adolescent skeletons from the North Cemetery of St. Mary Magdalen are highly consistent with lepromatous leprosy. These include pathognomonic rhinomaxillary changes (resorption of the anterior nasal spine, remodelling of the nasal margins, abnormally porous/new bone formation on the oral and nasal surfaces of the palatal bones, destruction of the inferior nasal conchae and vomer, abnormal porosity and resorption of the alveolar process (Figure X), acro-osteolysis/resorption and concentric atrophy of the hands and feet (destruction and remodelling of the phalanges, metacarpals, and metatarsals), mediolateral remodelling of the metatarsal shafts, resorptive grooves on the palmar surfaces of the hand phalanges (or termed volar grooving – Andersen and Manchester 1987) caused by flexion contractures, tarsal fusion and dorsal exostoses (Andersen and Manchester 1988, and subperiosteal new bone formation on the distal shafts of the tibiae and fibulae. Four individuals (SK. 8, SK. 28, SK. 52, SK. 56) also showed (rare) evidence for leprogenic odontodysplasia, which is the concentric constriction and dysplastic development of the anterior maxillary dentition caused by leprosy contraction in early childhood (Danielsen 1970; Reichart 1976). The development of leprogenic odontodysplasia and the pathological skeletal lesions associated with lepromatous leprosy are presumed to commence at approximately the same time (Ortner 2008), revealing a more defined chronology for the onset of skeletal changes and the time elapsed before death.

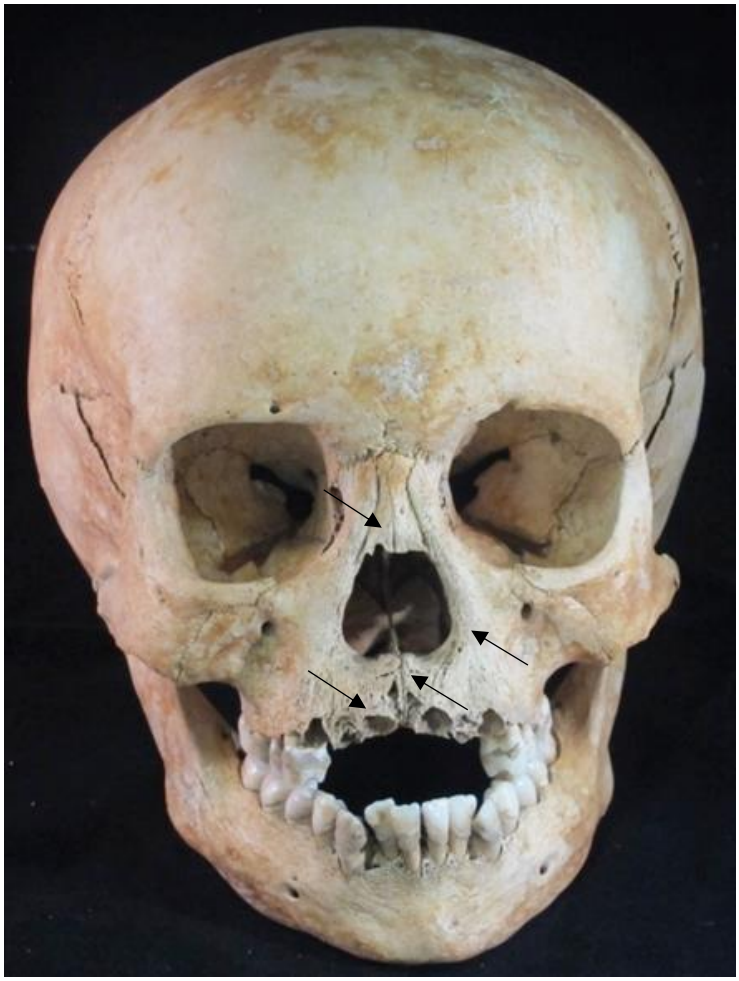

Figure X. Skull of SK. 52 from the St. Mary Magdalen Leprosy Hospital (Winchester) displaying evidence of rhinomaxillary syndrome including rounding of the nasal aperture, resorption of the anterior nasal spine, recession of the alveolar margin, and widening and flattening of the nasal bones.

Although St. Mary Magdalen was a dedicated facility for individuals with leprosy, it is important to note that a human body experiencing leprosy is also open to other health problems, and there were several concomitant pathologies identified in the skeletons excavated that showed signs of leprosy. All of the adolescents from the hospital possessed at least one non-specific indicator of childhood stress (linear enamel hypoplasia and cribra orbitalia), and eight of the them yielded a higher dental development age in comparison to their skeletal age; both these observations potentially indicate arrested development as a consequence of the disease but other aetiologies could also be important, for example a poorly balanced diet. Other comorbidities included, pathologically induced fractures, possible tuberculosis or mycotic infections, residual rickets, osteoporosis, and a person with evidence of a lower leg amputation, likely the result of a disease affecting the leg. Amputation is particularly relevant because amputations are an indicative aspect of interventional palliative care (Roffey and Tucker 2012; Tilley 2017). All individuals also displayed moderate to high levels of dental calculus formation (i.e. mineralised plaque), which is commonly found amongst modern lepromatous leprosy patients and may be an indicator of poor oral hygiene resulting from inflammation of the oral cavity, mouth-breathing due to facial paralysis and/or chronic inflammation of the nasal passages, or a softer, mushy diet (Reichart 1976; Ogden and Lee 2008; Souza et al. 2009; Rawlani et al. 2011; Roffey et al. 2017).

Bioarchaeological Interpretations of Care and Treatment of Leprosy

In order to examine care and treatment in the past, bioarchaeologists customarily study the treatment of the dead through burial contexts, pathological lesions, and evidence of palliative care (Roberts 2018). The Index of Care Framework (Tilley and Cameron 2014; Tilley 2017) has been used more recently to provide a holistic platform in which to assess the care (clinical and communal) a person would need to survive in a society based on the pathological lesions present on the skeleton, and what might have been provided. Roberts (2017) applied this Index of Care to a male aged 25-35 who had bone lesions related to leprosy and who was buried in the cemetery of St. James and Mary Magdalene leprosy hospital at Chichester (12^{th} – 15^{th} centuries AD). On the basis of the bone lesions and their chronicity (e.g. rhinomaxillary syndrome, acro-osteolysis of the hands and feet, tibial and fibular subperiosteal new bone formation), Roberts (*ibid*) demonstrated that he would have likely required significant personal palliative care, but that there was insufficient contextual data to indicate that he actually received that care within the leprosarium (*ibid*). Indeed, the process of using the Index of Care in an archaeological context can be fraught with uncertainty due to the incomplete nature of the data. Notwithstanding, if the Index of Care framework can stand to scrutiny in terms of the data, analysis, and interpretation, whilst acknowledging the inherent limitations, it might be used to support the historical evidence that people with leprosy were indeed cared for in the past. Given that this person (C148), amongst others buried at the site, dates from a time period that allegedly was at the height of leprosy isolation (Roberts 1986; Roberts 2002), it is worth investigating if this, and other, models apply to individuals from earlier contexts to explore whether a continuity of care exists.

Facing Lepromatous Leprosy – An Index of Care

As Tilley (2017: 11-12) asserts, provisioning for those affected by illness is a common human behaviour through time, but is accompanied by physical and psychological stress for the caregiver. Therefore, the skeletal remains of individuals who are supported during chronic, debilitating illnesses also reflect the willingness, experience, knowledge, beliefs, politics, economic status, and compassion of the caregivers, and societal responses, to diseases during their lives (*ibid*). However, crafting a framework that supports these variables with a view to the past is not without complications (Tilley and Schrenk 2017; Tilley 2017). In order to lessen these complications, a bioarchaeology of care methodological approach was developed to provide a multi-staged, case-based research framework to demonstrate whether care was provisioned for an individual, or if they were left without medical and societal support (Tilley and Cameron 2014). Following the methods of Tilley and Cameron (2014) and Tilley (2017), the Index of Care online platform (indexofcare.org) was applied to Sk. 19 (the individual at St. Mary Magdalen with the most severe and likely disfiguring changes) to assess the clinical impacts and functional implications of his experience. In doing so, the research tested whether a model of care could be constructed, and whether broader implications regarding whether a group agency model of provision could be ascertained. The results of this assessment are presented in Tables X-X.

Sk. 19 was a c.25 year-old male excavated from the North Cemetery, whose burial context revealed evidence of shrouding (i.e. a copper alloy shroud pin) and pottery vessels adapted for feeding (Roffey and Tucker 2012). The remains of Sk. 19 showed bone changes diagnostic of advanced lepromatous leprosy. These include rhinomaxillary changes such as flattening, fusion and resorption

of the anterior of the nasal bones, rounding, thickening and resorption of the margins of the nasal aperture, complete resorption of the maxilla, including the anterior nasal spine, back to the first molars, and resorption of the hard palate with porosity of the remaining bone (Figure X).

Figure X. Skull of Sk. 19 demonstrating advanced rhinomaxillary syndrome including widening and fusion of nasal bones, widening and remodelling of nasal aperture, and complete loss of the anterior nasal spine, alveolar process of the maxilla, and hard palate.

Other significant bone changes include changes to the hands such as concentric diaphyseal remodelling of the mid-shafts of the metacarpals; sharp-edged “scooped-out” lesions around the metacarpal heads; flattening of the first metacarpal heads, subperiosteal new bone formation on the metacarpal shafts with a probable fracture of the right fifth metacarpal, partial and/or complete resorption of the distal phalanges; concentric diaphyseal remodelling of the mid-shafts of the proximal phalanges; and volar grooving of the proximal phalanges indicating flexion contractures (Figures X).

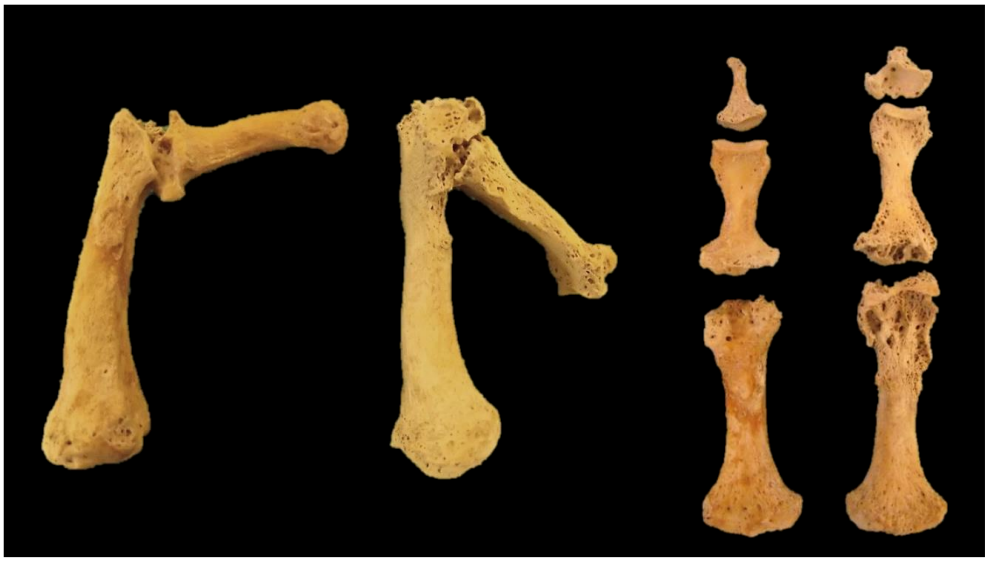

Figure X. Hand phalanges of Sk. 19 showing volar grooving likely indicative of long-term flexion contractures.

Changes to the lower limbs and feet included resorption of the bones of the right foot to the proximal bases of the metatarsals (Figure X), destruction and fusion of the cuneiforms, cuboid, and navicular, porosity of the posterior of the right calcaneus, as well as lamellar and woven subperiosteal new bone formation along the tibial and fibular diaphyses.

Figure X. Right foot of Sk. 19 demonstrating bone resorption to proximal metatarsals and fusion of tarsals.

The left foot was absent and there was diffuse lamellar, woven and subperiosteal new bone formation on the tibia and fibula, showing a tapering towards the distal ends of the fibular diaphysis. The distal epiphyses of the tibia and fibula are absent, and the distal diaphysis of the tibia is flattened with rough, porous cortical bone and the remains of the medullary cavity in the centre. The bones are not atrophied but the cortical bone is greatly thinned and they are ankylosed at the distal end by bony bridging. This appears to be a deliberate amputation (Figure X).

Figure X. Left lower limb of Sk. 19 showing amputation at the distal end.

Although it is currently not possible to know whether Sk. 19, and indeed the other individuals found at St. Mary Magdalen were long-term patients or simply buried there at death (as suggested by Roberts 2017 in her study), the combination of skeletal lesions, demographic makeup, and burial and archaeological context indicate that people buried there had advanced signs of lepromatous leprosy by the Late Saxon period in Winchester, and that leprosy was affecting a large portion of younger individuals buried at St. Mary Magdalen leprosarium. As previously mentioned, these individuals were buried in a manner usually reserved for high-status ecclesiastical sites, but with the retention of burial goods indicating aspects of individual identity (e.g. pilgrim badges, individual feeding implements) (Roffey and Tucker 2012).

The clinical impacts comprised within Stage 2 of the Index of Care framework indicate that all bodily systems/function (Figure X) could have been affected by lepromatous leprosy. Further, aspects of daily living as detailed in the Index of Care framework (Table X) indicate that this man likely required assisted care based on his bone changes (Figures X-X).

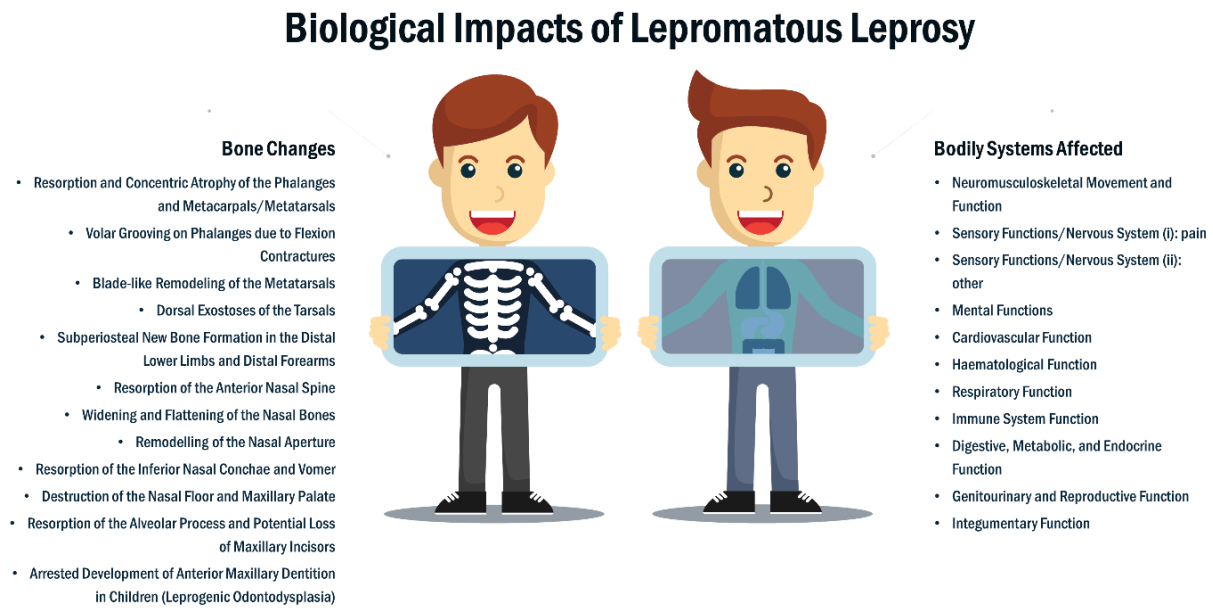

Figure X. Biological consequences of having lepromatous leprosy, including skeletal changes and body systems affected (Walker and Lockwood 2006; Ortner 2008; Lastoria and Abreu 2014).

Table X. Impact of Leprous Bone Changes on Aspects of Daily Living for Sk. 19 and individuals with similar bone changes when they were alive.

Activities of Daily Living

BASED ON OBSERVED BONE CHANGES ASSOCIATED WITH LEPROMATOUS LEPROSY

	CAPABLE	INCAPABLE	UNKNOWN	OBSERVATIONS
Self-provisioning: ability to manage access to food and drink unaided (e.g. independently access nearby sources of food and water).		X		Likely incapable. Sk. 19 was missing left and most of right foot. Hand function would have largely ceased due to prolonged flexion contractures and finger resorption as skeletally evidenced.
Self-feeding: ability to physically eat and/or drink without assistance (i.e. to convey food and drink to mouth).			X	Grave goods indicate individual, specialised feeding utensils, that they would not be able to make themselves, but were likely adapted to enable self-feeding. Despite these feeding implements, with the severity of the maxillary destruction, they may have still required assistance with drinking and eating.
Managing basic personal caring for self: (e.g. washing, toileting, preserving skin integrity; treating infection, managing infection risk).		X		Mobility and hand function would have been incredibly impaired. Bilateral flexion contractures of the hands, amputation of left foot and resorption of right foot would have likely necessitated help in management of basic personal care.
Basic object manipulation: ability to manage items in the immediate environment; includes self-dressing, item retrieval, etc.			X	Likely loss of hand and sensory functions would complicate basic object manipulation, self dressing, and retrieval of items. Sk. 19 would possibly have needed assistance for many of these, but the extent to which he needed assistance cannot be determined by his skeletal lesions
Mobility over limited distance: ability to move unaided over short distances (e.g. inside/around dwelling, out of range of potential hazards)		X		The loss of Sk. 19's left foot, almost complete resorption of right foot, and compromised hand function would likely require some form of aid to move any distance.
Control over body position: ability (re)position body parts as desired without assistance (e.g. to sit up and transfer body weight from a reclining position unaided).			X	This cannot be ascertained with the skeletal evidence available and is therefore, unknown.

When considering components of care practice with regard to needs for direct support and accommodation (Table X, Table X), Sk. 19 and others with similar skeletal lesions associated with lepromatous leprosy likely needed long-term clinical, medical, and economic infrastructures to survive (see Figure X. – Group Agency Model).

Table X – Model of care considering the probability of need for direct support required from other people to survive with the bone changes present in Sk. 19.

Need for Direct Support

Probability of Support Needed from Others

COMPONENTS OF CARE PRACTICE	NEED FOR CARE	COMMENTS	EFFORT/RESOURCES INVOLVED
Provision of food and water	Probable	Buried with specialised feeding equipment	Work undertaken to gather, cook, and provision food and water for individuals.
Maintaining normal body temperature	Probable	Was found in a leprosy hospital cemetery, with the interpretation they received care there.	Effort undertaken to provide shelter, clothing, bed, and warmth to individual.
Facilitation of comfort, rest, and sleep	Possible	The bone changes make it unlikely for Sk. 19 to be able to build his own bed, weave a blanket, or start a fire on his own.	A bed, blanket, and shelter would have likely been supplied, potentially long-term.
Maintaining/assisting mobility	Probable	Sk. 19 had significantly compromised mobility, and would have needed assistance in the most basic tasks.	Sk. 19 needed substantial assistance to be mobile, and would have likely required aid to travel any distance.
Monitoring health status	Probable	Had evidence of amputation, implying palliative care and possible surgical care was available to him at one point.	Likely palliative provisions including hygiene and bandaging supplied for this person to avoid further infection.
Maintenance of personal hygiene/protection of integument	Probable	Without hand/foot function, would probably need assistance with hygiene and self-care.	Sk. 19 likely needed assistance with hygiene and protection of sores/open wounds (e.g. amputation) and dressings to avoid subsequent infection.
Physical manipulation/postural adjustment	Possible	No evidence of decubitis lesions indicates no long-term pressure/bed sores	Sk. 19 may have needed assistance in/out of bed without the full use of his hands and feet.
Maintenance of physiological functioning	Unknown/Probable	It is unknown what specific of medical provisions were specifically available in the St. Mary Magdalen leprosarium.	It is likely that some medical and food provisions (medical and nutriment) contributed to individual physiological functioning
Specific intervention(s) and technologies	Probable	Evidence for the amputation of left foot	Would have required skilled medical practitioners to treat.

Table X – Model of care considering the probability of need for accommodation and support across multiple divisions.

Need for Accommodation

Probability of Need for Support

	DOMAIN	NEED FOR CARE	COMMENTS	EFFORT/RESOURCES INVOLVED	EVIDENCE FOR EFFICACY OF CARE
	DOMESTIC	Probable	Sk. 19, and others with similar bone changes, might be able to contribute to domestic life with supported adaptations or activities.	Near the end of Sk. 19's life, they were less likely to contribute to domestic activities due to the severity of their leprosy.	Care was effective enough for Sk. 19 to live long enough to develop skeletal lesions.
	MOBILITY	Probable	Sk. 19 would have required substantial assistance to travel any distance.	If Sk. 19 had to travel with his end of life pathological lesions, he would have needed assistance to go any distance, and possibly to be transported by cart.	Unknown
	ECONOMIC	Probable	Buried within a leprosarium context with the interpretation that he was resident there, with food and shelter provided.	Food, shelter, blanket, chairs, assistance devices, etc. would be required for Sk. 19.	Care was effective enough for Sk. 19 to live long enough to develop skeletal lesions.
	BASIC LIFESTYLE	Probable	Found in context with leprosy hospital	Would have needed provision for food and water, including obtaining, cooking, probable assistance eating, probable assistance drinking, etc.	Care was effective enough for Sk. 19 to live long enough to develop skeletal lesions.
	COMMUNITY	Possible	Sk. 19 possibly needed individual or social support to participate within the community.	Any community interactions would likely require someone to assist Sk. 19 with movement and potentially verbal engagement.	Unknown

From these aspects of bioarchaeological enquiry, particularly through the Index of Care model, it can be interpreted that people with leprosy were likely provided with care at St. Mary Magdalen, and not necessarily neglected. In order to facilitate this type of care at the leprosarium level, wider economic and cultural resources are needed to enable a group agency model for health-care provision (Figure X), meaning these provisions must have been sanctioned and supported at a wider societal and administrative level. Despite the Index of Care framework demonstrating that individuals at St. Mary Magdalen were likely cared for (in the form of medical and daily support), we must bear in mind that people do not experience disease in the same way (Ortner 1991: 7-11). For example, 10 people with leprosy can have a range of impacts from the disease that will not all be the same, or with similar levels of severity or disability. In addition, the immune spectrum of leprosy ranging from high to low resistance and other types in between will show different impacts on people today compared to pre-biotic eras.

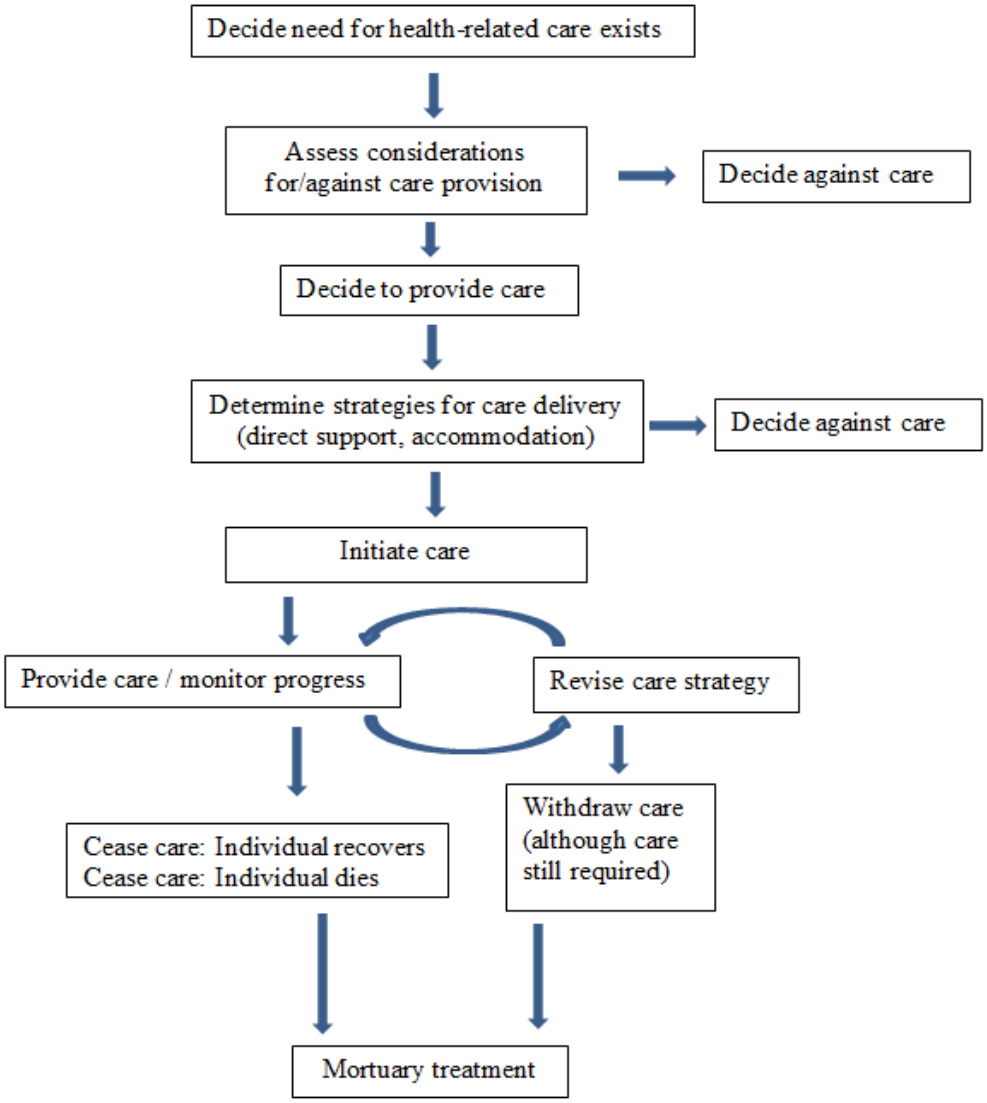

Figure X. 'Decision Path' in the health-related caregiving process for a group agency infrastructure (From IndexofCare.org).

Discussion and Conclusions

This research aimed to explore the social and biological impacts of young people with leprosy in Saxo-Norman period England through a thematic approach of alloparental care and an evaluation of evidence for care and treatment. Historical documents detail that in seeking medical provision for their children, parents were active participants in seeking and negotiating care, and not peripheral bystanders. Benedictine Rule also likely required parental involvement upon their admission into the hospital and mandated provisions and a duty of care once under the alloparental umbrella of the monastery. Although contemporaneous historical records do not specifically record social sensibilities towards leprosy in children, interpreting the funerary and skeletal evidence of young individuals displaying advanced signs of leprosy aid in filling in these historical lacunae. Adolescents with skeletal lesions diagnostic of lepromatous leprosy make up the majority of individuals buried in the North Cemetery at the St. Mary Magdalen leprosy hospital site and the deleterious effects of their disease status potentially affects all aspects of daily living including the way they move around, their food preparation, food consumption, etc. This may lead to significant impairment, and within in the archaeological context under study here, support the necessity for monastic-led care provisions via an alloparental/caregiver model for these adolescents.

The Index of Care Framework has previously been applied to an adult male from Late Medieval Chichester to further draw together several lines of clinical, sociological, and bioarchaeological evidence of care (Roberts 2017). This model of care was replicated for Sk. 19 from the St. Mary Magdalen leprosy hospital. The results indicate that a complex, group agency model of care likely existed to provide care for these adolescents.

Access to medical care could be difficult in the past and the overall effectiveness of conventional medical treatments likely did not inspire confidence (Kroll and Bachrach 1986). Given the tremendous efforts involved in seeking assistance for ill children, including transport, provision of care, and parental consent for the admittance of young people into these monastic facilities, our understandings should be shifted more towards a positive view of how early medieval parents felt towards their children. If people did not 'care' or expelled their loved ones for contracting leprosy, we would expect abandonment and isolation, not potential long-distance travel and admittance into a hospital. This demonstrates how applying multiple models of care can elucidate social responses to disease in the past, and the efforts made to help the weakest amongst them. It also reaffirms the benefits of studying youth as a vulnerable subset of society that can serve as a highly sensitive, more accurate cultural barometer (Redfern and Gowland 2011; Roberts and Bernard 2015; Lewis 2017; Mays et al. 2017).

What this model cannot tell us, however, is the lengths people would have travelled to seek this hospital care, e.g. did they travel from further afield or were they only accommodating adolescents from the local communities? Likewise, we are unable to fully demonstrate how long they spent within the leprosarium before death and what care was like after admittance, e.g. were they fed an adequate diet? In future, the inclusion of multi-isotope analyses can help to add to this growing re-evaluation of past leprosy narratives. Radiogenic strontium and stable oxygen isotope analyses can help to reveal particulars about the mobility histories of individuals to ascertain what the catchment area of places like St. Mary Magdalen in Winchester was (Evans et al. 2010; Evans et al. 2012;

Kendall et al. 2013). If people were travelling a far distance to the hospital, this may indicate that the treatment afforded was widely-known and that it was not a place of banishment. Likewise, similar analyses of non-leprosaria contexts (e.g. parish cemeteries) revealing individuals with leprosy may help to understand transmission dynamics and community responses. Additionally, stable isotope analyses of carbon and nitrogen from incremental dentine can reveal diets and pathophysiological reactions of young leprosy sufferers from around birth to death if the tooth is still forming, providing some indication of their lived experiences before and after admittance (Beaumont et al. 2013; Beaumont et al. 2015; Beaumont and Montgomery 2016). Because previous assertions about the way people in the past with leprosy were treated have demonstrable effects on people afflicted with the disease today, it is worth exploring these and other lines of evidence to better understand societal reactions to disease in the past and challenge commonly regurgitated and stigmatising disease narratives.

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