

# In sickness and in health

## An archaeological and osteoarchaeological analysis of St. Gertrude's infirmary in Kampen (1382-c. 1611)

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### **Introduction**

In 2011 and in 2014, large-scale excavations were conducted at the Margaretha and Myosotis area, west of the city centre of Kampen, as a result of the planned construction of a new care home at the site. The excavations brought to light remains of a medieval infirmary that included a chapel (*gasthuiskapel*), cemetery as well as houses from the 14<sup>th</sup> century. This chapter will focus on the infirmary and 89 primary skeletal remains found in 2014 to learn more about medieval health care in Kampen. Specific questions will address who was cared for in the hospital and what kind of diseases were treated in this infirmary. To place the results in a broader context, comparisons will be made with other hospital collections from the Netherlands. This article will conclude with a discussion on whether hospital collections have a specific osteoarchaeological signature, that is, are hospital patients recognisable through demographic and palaeopathological characteristics?

### **St. Gertrude's infirmary complex**

The infirmary was located on a large plot of land bordered by the Boven Nieuwstraat, Burgwal, Geerstraat, and the current Burgwalstraat, formerly known as Extersteeg (Fig. 1). In 1382, Johan van Hattem left money to St. Gertrude's infirmary in his will, which indicates that in 1382 the hospital must have been operational.<sup>1</sup> In this early period, the size of the complex was fairly small, most likely consisting of an infirmary hall (*ziekenzaal*) but not much else. A reference from 1405 indicates that eight beds on one side of the hall were reserved for the sick, while on the other side an unspecified number of beds were meant to be used by the poor and mendicants, generally referred to in historical sources as *arme ellendigen* (the miserable poor). In 1487, the alderman and the council of Kampen decided that the infirmary would

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<sup>1</sup> Jager 2015, 352; Van Santen 2017, 30.

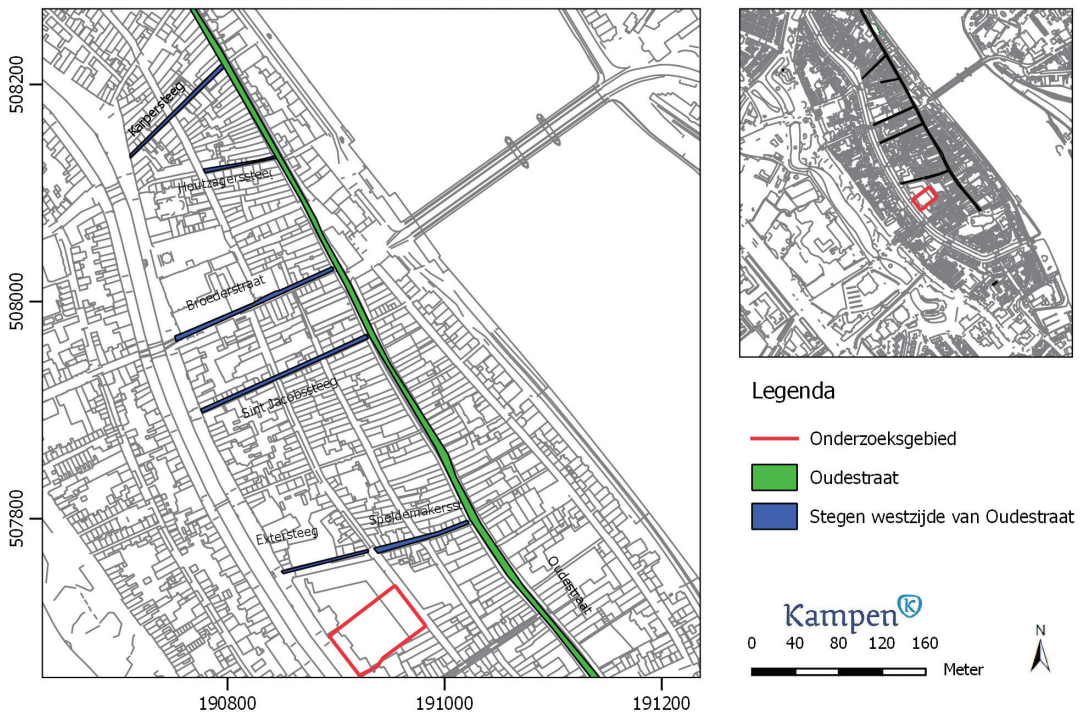


Fig. 1: Location of the research area (indicated in red) and adjoining streets (blue and green).

not be allowed to take in more than 40 people, which indicates that over the course of 80 years, the infirmary expanded dramatically. From this period onwards, there were also places on the infirmary grounds for the *proveniers*, individuals, both men and women, who paid a sum of money in order to receive board and care for the duration of their lives. Those individuals were most likely not housed in the main infirmary hall but were allowed to live in small houses adjacent to the main building. In addition to the sick, *arme ellendigen*, and *proveniers*, occasionally other types of people were admitted to the hospital. In the 16<sup>th</sup> century in relation to the Eighty Years' War, Prince Mauritz requested the hospital take in wounded soldiers. Important to note is that when the *proveniers* or other patients died in the hospital, their possessions and other assets became the property of the infirmary.<sup>2</sup>

The first indication of the presence of a chapel on the complex is from 1418. In that year, a new altar was installed in the northern part of the chapel.<sup>3</sup> Adjacent to the back of the chapel were two privy cellars which may have belonged to a later annex of St. Gertrude's infirmary. The annex appears to have been a free-standing building behind the chapel that had been incorporated into a garden wall. The cesspits and the nature and composition of the finds in them allow a tentative interpretation of these structures as the hospital's kitchen and privy.

2 Van Santen 2017, 31.

3 Klomp 2017, 95.

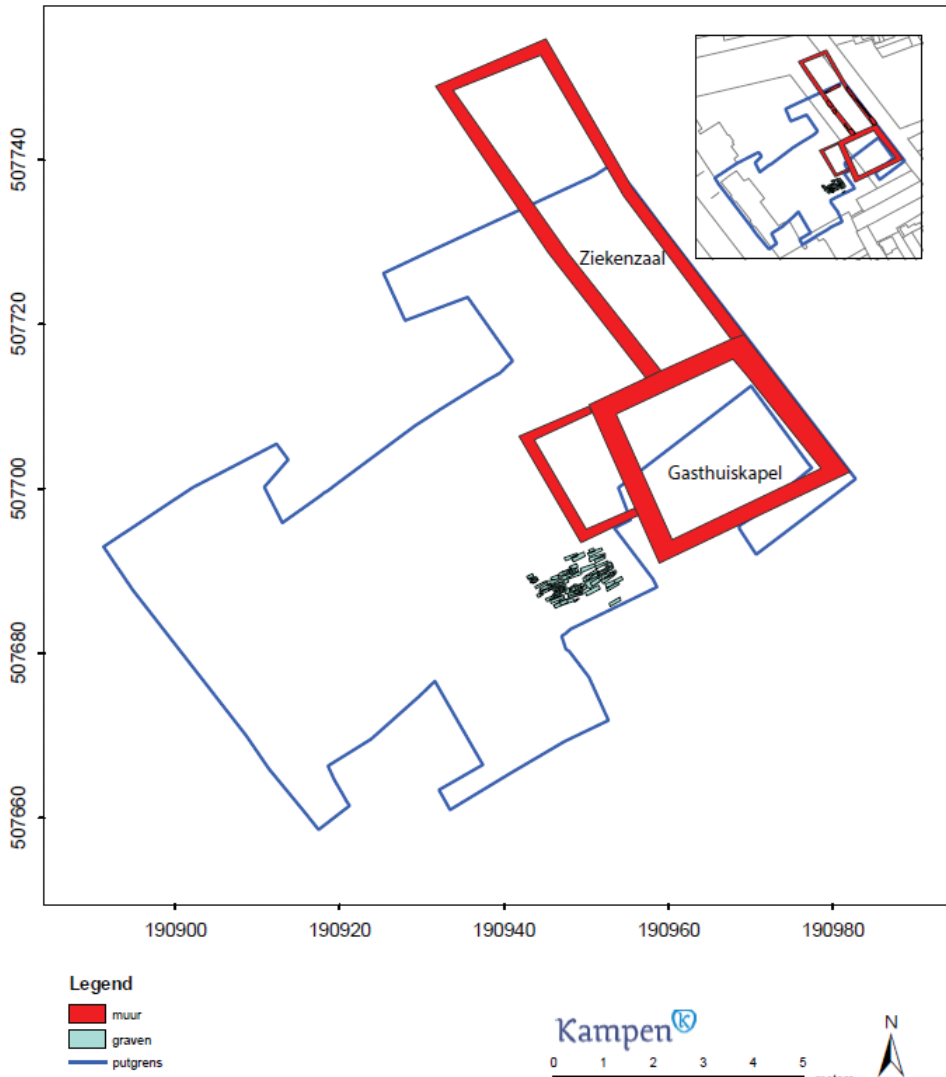


Fig. 2: Overview of excavated area (blue outline). Walls of the chapel and infirmary hall are indicated in red. Location of the burials is indicated in light blue.

St. Gertrude's infirmary existed as such until 1598, when it was amalgamated with other infirmaries in Kampen. However, the complex functioned up until 1611 when the chapel was destroyed. While the infirmary hall remained standing until 1897,<sup>4</sup> the associated cemetery became inactive after the destruction of the chapel. The cemetery will be discussed in more detail in the next section.

The archaeological excavations in 2011 and 2014 revealed traces of the infirmary hall, the chapel, and the cemetery (Fig. 2). The infirmary hall was located in the northeastern corner of the complex, parallel to the Boven Nieuwstraat. In 2011,

<sup>4</sup> Jager 2015, 352.

the most northern part of the hall was excavated.<sup>5</sup> In 2014, the excavation began where it had ended in 2011, and the pit was extended towards the south, revealing a cross wall. Evidently, the infirmary hall had been divided into two rooms. It is possible that this more southern area of the infirmary hall dates to a later phase, which could be related to the expansion of the infirmary in the early 15<sup>th</sup> century.<sup>6</sup> In 2014, excavations also revealed the foundations of the chapel directly to the southwest of the infirmary hall, extending along the Boven Nieuwstraat.

### **St. Gertrude's cemetery**

The cemetery lay to the south and southwest of the chapel. Part of this cemetery had already been destroyed in the construction of the kitchen of the care home in 1970. It is to be expected that the cemetery was much larger in medieval times than the area excavated in 2014. Yet a total of 89 primary inhumations and some secondary depositions were recovered from the cemetery. Burials most likely began around the time the infirmary was founded in the early 1380s and ceased in the beginning of the 17<sup>th</sup> century; unfortunately, a more detailed internal chronology is currently not available.

### *Coffins?*

Based on the lack of wood associated with the burials, it is unlikely that coffins were regularly used for burial at the infirmary cemetery. Wood remains suggestive of a coffin were encountered with one burial, but this was an exception. Considering that wood was preserved very well at the site,<sup>7</sup> it is to be expected that if coffins were used, remnants of those would have been encountered more frequently during excavation. The bones, however, suggest that there was some initial protection from the soil. In most of the burials for which this is observable, flattening of the rib cage and pelvis was noted, a clear sign that initial decomposition of the soft tissues took place in an open space, that is, no soil around the body.<sup>8</sup> In addition, there were some displacement of bones outside of the volume of the body, indicating that upon decomposition there was space around the body. So if this space was not the interior of a coffin, it is likely that shrouds were used to cover the bodies upon interment.

### *Orientation and position*

All individuals in the cemetery were buried in an extended supine position with their head to the southwest and feet to the northeast. This is a slight deviation from the norm: it is more common in Christian cemeteries to be buried with the head to the west and feet to the east, as on the Day of Judgement the deceased would then be facing east where Christ would be coming when they rose.

Interestingly, there is one individual who was found in a prone position (face down) (Fig. 3). It is possible that this was deliberate, but it could also have been an accidental occurrence. Or it is also possible that shortly after death the burial

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5 Bouma & Korenberg 2014, 49-50.

6 Klomp 2017, 100.

7 Several remains of wooden houses and partial foundations were found at the site (Klomp 2017, 99).

8 Duday 2009, 32-38.



Fig. 3: Individual S4013V1008 buried in a prone position, evidenced by the visible posterior view of the legs and thorax.

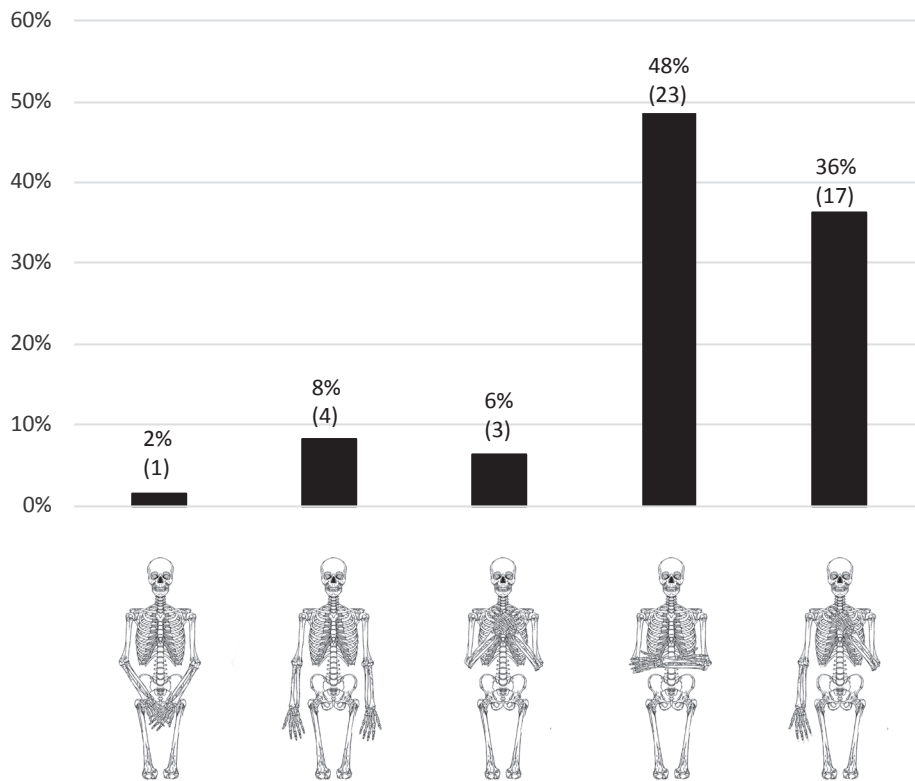


Fig. 4: Arm positions (N=48).

environment changed (i.e., a secondary void was created), resulting in the body rotating.<sup>9</sup> This individual was still oriented southwest-northeast.

<sup>9</sup> See Duday's discussion on secondary voids in burial contexts (2009, 46-52). Generally, secondary voids are created by the decomposition of perishable materials within the grave context, such as head supports, clothing or even coffins.

The arm positions appear to have varied in the burials at this site, although both arms could only be observed for 48 individuals. The majority of individuals were buried with their arms and hands on the abdomen (48%), while a smaller portion of individuals had their arms extended alongside the body. There were some individuals with tightly or very tightly flexed lower arms, either positioned on the chest or even on the upper arm. Interestingly, for a large portion of individuals for who both arms could be observed, there were differences between the position of the right and left arm (36%) (Fig. 4). This variation in arm positions may be related to the absence of coffins, upon burial a body in a shroud is less constrained than a body in a coffin, potentially allowing for movement of arms. The legs were extended and positioned next to each other in all burials for which femora, tibiae and fibulae were observable.

### St. Gertrude's skeletal population

All 89 primary burials were subjected to a physical anthropological analysis to study the demographic composition of the buried individuals as well as perform an assessment of the present pathological conditions, which is particularly interesting considering that this was an infirmary context. Below, an overview of sex and age-at-death estimations<sup>10</sup> will be presented and then special attention will be given to the evidence of disease in this collection. Comparison will be made with skeletal collections from other infirmary contexts, specifically those from Breda (1294-1637)<sup>11</sup> and Delft (1265-1652).<sup>12</sup>

#### *Demographic composition*

Sex could be estimated for 66 of the 78 adult individuals (85%) excavated at the infirmary site. In total, there were 42 men (64%) and 24 (36%) women in the collection. Clearly, there were more men buried in the cemetery. Interestingly, this appears to be common at other hospital sites as well. At the medieval infirmary in Breda, there were also substantially more men than women in the skeletal sample.<sup>13</sup> The same is true for the *Oude en Nieuwe Gasthuis* in Delft, although there the difference in numbers between the sexes was smaller (53% vs. 45%).<sup>14</sup> For the Breda collection, the researchers explained the large sex difference by the occurrence of several violent conflicts during the active period of the infirmary, which would have resulted in a high number of male casualties. Considering that Kampen was besieged during the Eighty Years' War like Breda, it is possible that this contributed to the male surplus in the Kampen collection as well. As indicated above, Prince Mauritz requested that several groups of wounded soldiers be taken in by the hospital, which fits with the osteoarchaeological findings.

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10 Adult sex and age at death have been estimated using the methods outlined in the WEA 1980; Buikstra & Ubelaker 1994; Buckberry & Chamberlain 2002; Phenice 1969. For estimating age at death in non-adults the methods described by Schaefer *et al.* 2009 were employed.

11 De Jonge 2017; De Jonge & Baetsen 2013.

12 Onisto *et al.* 1998.

13 De Jonge 2017, 96-97.

14 Onisto *et al.* 1998, 10.



The age-at-death estimation of the 89 individuals showed that the majority were over 18 years when they died (Fig. 5). Only 11 of the 89 individuals (12.4%) were non-adults. Of these 11, all are above the age of four years at time of death. While this would be remarkable at regular cemetery excavations, though not uncommon, considering the general high mortality of children in the medieval period,<sup>15</sup> this is not extraordinary for an infirmary site. Sick children were generally cared for at home or brought to a foundling asylum.<sup>16</sup> This may explain the lack of infants under the age of three in the cemetery. However, it also has to be taken into account that previous disturbances at the site damaged graves, which could have resulted in the destruction of some of the non-adult graves. This lack of infants seems to have occurred at other infirmary cemeteries sites as well. At the Delft infirmary, only 5.8% of the individuals were under the age of ten when they died.<sup>17</sup> In Breda, there are some infants and young children buried (<5 years), but this group only represents 4.9% of the total burial population.<sup>18</sup>

Of the adults in the Kampen collection, we see that the majority of individuals died between the ages of 36 and 45 years (Fig. 5). However, when we separate the adults according to sex, a different pattern emerges (Fig. 6). Most of the men in the collection died between the ages of 26 and 35. It is possible that the large portion of younger men is related to the soldiers housed in the infirmary, although then a larger number of men in the youngest age category (19-25 years) could be expected as well. For the females, there is a radically different pattern: most of the females died between the ages of 19 and 25 years or between the

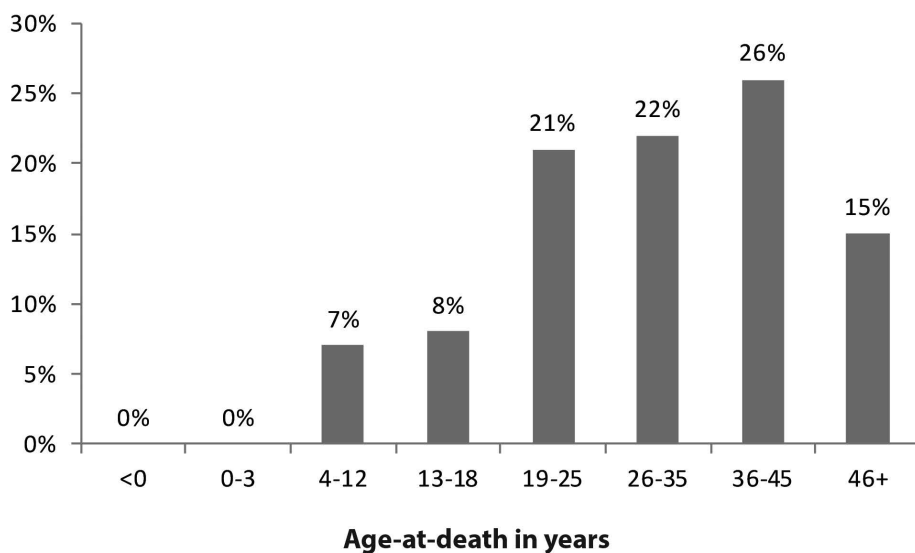


Fig. 5: Age-at-death distribution (N=89).

15 Lewis 2006, 22.

16 Onisto *et al.* 1998, 15.

17 Onisto *et al.* 1998, 36.

18 De Jonge 2017, 97-99.

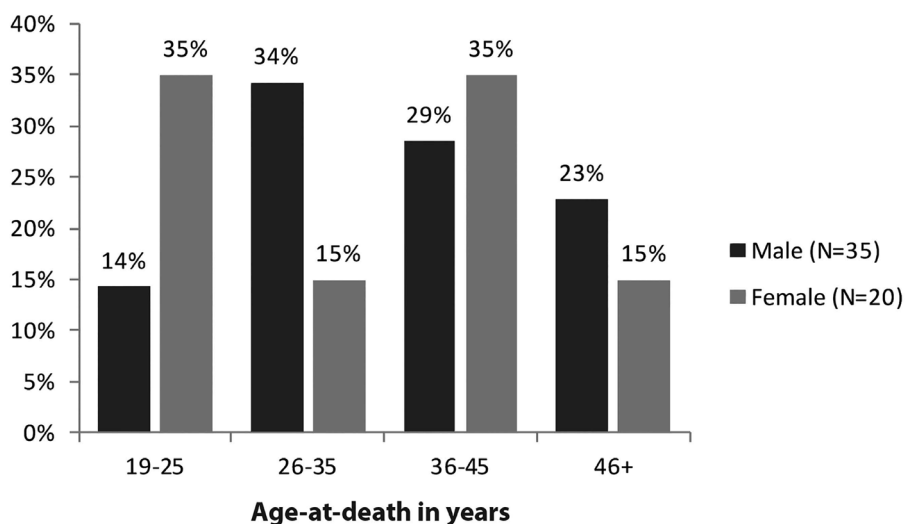


Fig. 6: Adult sex and age-at-death distribution (N=55).

ages of 36 and 45 years. A high number of females in the younger age category is generally explained by the risks associated with childbirth. Although this is a plausible explanation in regular parish cemeteries, it is not expected that women with childbirth complications would be admitted to the hospital. Therefore, it is more likely that there is a different explanation for the high percentage of females between 19 and 25 years in the Kampen skeletal collection. Although the presence of several maidservants<sup>19</sup> would increase the number of young women in the infirmary, it is unlikely that they would have all died young, and even if they had, it is unlikely they would be buried in the infirmary cemetery. As of yet, there is no satisfactory explanation for the high percentage of young females other than coincidence.

### Health and disease

Considering that this is an infirmary population, the discussion on the type of pathological conditions is particularly interesting. In the following section, the frequency of diseases in relation to the context and in comparison with the other infirmary collections mentioned above will be discussed. The focus will be on a selection of the occurring diseases and afflictions; for a complete overview, please review the skeletal report.<sup>20</sup>

### Infections

What stands out in this collection is the high percentage of individuals who showed signs of infection. Almost 40% of individuals demonstrated periosteal new bone (PNB) on their legs as a result of an inflammation of the periosteum. While this type of pathology can be caused by various factors, such as local trauma or

<sup>19</sup> Van Santen 2017, 33.

<sup>20</sup> Schats 2017a.



strenuous activity,<sup>21</sup> when new bone formation is noted bilaterally and on multiple bones within the same individual this generally points to a systemic infection. Since this was the case for most individuals with this type of pathology, it is possible to say that many of the individuals in the Kampen collection experienced a systemic infection. Unfortunately, due to the non-specific nature of this lesion, it is not possible to identify the infection. Although the large number of individuals with PNB is not out of the ordinary considering that this is a hospital collection, the percentage of affected individuals is very high in comparison with the Breda infirmary skeletons, where only 5.9% of individuals were affected.<sup>22</sup> It is unfortunately difficult to explain this large difference between the two infirmary collections. Potentially this could be an indication that different types of people were admitted in Kampen in comparison to Breda.

When PNB is found on the ribs, it can be attributed to a more specific cause: lung infection. Even though some scholars equate the presence of PNB on the ribs with tuberculosis, it is not possible to specifically identify the type of lung disease. Although this type of lesion is very common in individuals with tuberculosis, other chronic lung infections, such as bronchitis or pleuritis, cannot be excluded on the basis of this lesion alone.<sup>23</sup> In the Kampen collection, there were four individuals (6.2%) with PNB on the ribs. This type of lesion does not appear in the Breda and Delft collections, although the characteristic vertebral lesions definitively associated with tuberculosis were found in both other infirmary sites. The definitive skeletal lesions directly caused by tuberculosis were not found in Kampen, which is interesting considering the clear presence of the disease in other urban and hospital collections dating to similar time periods.<sup>24</sup> Yet, seeing as tuberculosis only results in skeletal lesions in 2% of infected individuals, it is possible that the disease was present but not expressed in the skeletal record.

The only specific infection that was identified in the Kampen collection was syphilis. Three individuals demonstrated the skeletal lesions associated with this sexually transmitted disease. Syphilis, caused by bacteria of the *Treponema pallidum* species, is a chronic and debilitating illness. The onset of the disease is manifested by minor skin lesions, usually around the genitalia, but can result in marked skeletal lesions in the third stage of the disease.<sup>25</sup> The affected Kampen individuals, two adults (male and female) and an adolescent (male), show lesions on the long bones and skull (Fig. 7). The ribs and vertebrae remain unaffected, as is characteristic for this disease.<sup>26</sup> It is possible that the individuals who were affected by bilateral marked PNB on their long bones, suffered from syphilis as well, although it is not possible to say this definitively.

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21 Waldron 2009, 115-117.

22 De Jonge and Baetsen 2013, 241.

23 Waldron 2009, 117.

24 Clear cases of tuberculosis were also found in the medieval Franciscan cemetery in Alkmaar. See Schats 2016, 96-98.

25 Waldron 2009, 105-108.

26 Waldron 2009, 105-108.

The presence of syphilis at this site is notable considering the longstanding debate regarding the origin of the disease. One of the hypotheses is that Columbus brought the disease back to Europe in 1493,<sup>27</sup> so if these individuals predate the return of Columbus, this hypothesis would be called into question. Considering the fact that burial at Kampen took place from 1380 onwards, the three syphilitic individuals may potentially predate 1493. To study this, rib samples were sent to the Centre for Isotopic Research in Groningen for radiocarbon dating. Unfortunately, although there is a 68% chance that the individuals died before 1493, the <sup>14</sup>C dates of these individuals have a broad range and therefore do not rule out the possibility that the individuals died post-1493. Moreover, the stable nitrogen and carbon isotopes ( $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$ ) indicate that the individuals most likely consumed fish. As a result of the reservoir effect,<sup>28</sup> the individuals may be younger than the radiocarbon results suggest.<sup>29</sup>

Syphilis was also encountered in the infirmary in Breda. Two adults and two non-adults appear to have been affected by this infection. The two non-adults show the dental lesions associated with congenital syphilis, indicating that the infection was transferred from mother to child in utero. As with the Kampen patients, the syphilitic individuals from Breda were subjected to radiocarbon dating to determine whether they predated 1493. Unfortunately, yet again, the range for most of the dates was broad, making it impossible to definitely state that the individuals died before the return of Columbus to Europe. The dates for one of the non-adults suggest a pre-Columbian date, but the diagnosis of congenital syphilis for this individual is less certain.<sup>30</sup>

## Trauma

Just like the high rates of infection, the high number of individuals with trauma is noteworthy. Of the 89 individuals studied, 28 demonstrated one or multiple fractures (31.5%). Most of the fractures had healed well and were located on the ribs, and are therefore unlikely to be the reason why these affected individuals ended up in the infirmary. Interestingly however, there were two elderly male individuals whose upper leg neck had been fractured (Fig. 8). Today this type of fracture is very common amongst the elderly and poses a major public health problem impacting survival rates and quality of life.<sup>31</sup> Although the present hip fractures had already healed when death occurred, it is likely that medical care would have been sought for a fracture like this and may therefore be the reason why they were in the infirmary. If they were cared for in the hospital for an extended period of time, this may explain the stage of healing. Five individuals showed a fracture in

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27 Meyer *et al.* 2002, 41-42.

28 The term 'reservoir effect' refers to 'an offset <sup>14</sup>C between contemporaneous organisms that derive their carbon from the terrestrial environment and those organisms that live wholly or partly in the marine environment' (Ascough *et al.* 2005, 533). As a result of the limited ability of a body of water to take in atmospheric carbon, the marine environment is depleted of <sup>14</sup>C in comparison with the surrounding atmosphere. Therefore, organisms that contain large amounts of marine carbon or consume products with a large amount of marine carbon may appear older than they, in fact, are.

29 CIO 2015, 2017; Schats 2017b.

30 De Jonge & Baetsen 2013, 242-244.

31 Cooper *et al.* 1992, 285.



Fig. 7: Skeletal lesions associated with syphilis in an adult female (S4084V1086). Top left: Caries sicca on skull. Bottom left: destruction and new bone formation, 4<sup>th</sup> right metacarpal. Centre: Cloaca (drainage hole for pus) with new bone formation on left upper leg. Right: Posterior aspect left ulna showing destruction and new bone formation.



Fig. 8: Trauma. Left: Fractured right femoral neck, note the extensive new bone formation on the anterior aspect. Right: Incomplete spondylolysis in a lumbar vertebra.

their lumbar vertebrae where the neural arch is separated from the body, a type of fracture also referred to as spondylolysis (Fig. 8). While this is very unlikely to be the cause for their stay in the hospital, the prevalence of this fracture type is relatively high (8.3%). Considering that spondylolysis is related to strenuous physical work, it may speak to the type of people being admitted to the infirmary. In comparison to the Delft (11.8%) and Breda (10.8%) fracture prevalence,<sup>32</sup> the number of individuals in the Kampen collection with fractures is high.

32 De Jonge & Baetsen 2013, 240; Onisto *et al.* 1998, 40-41.

In addition to fractures, there were two individuals (3.0%) with a dislocated arm. In both individuals, the arm was not reset to its original position and as a result created a new joint surface on the anterior portion of the scapula (shoulder blade). One of the individuals, an elderly male, had also broken several ribs and his right ulna, potentially as a result of the same traumatic event. Dislocated joints were also found in four individuals in Breda (1.4%).<sup>33</sup>

### Diffuse Idiopathic Skeletal Hyperostosis

In the Kampen collection, six individuals (10%) showed lesions associated with Diffuse Idiopathic Skeletal Hyperostosis (DISH). DISH is generally characterised as a metabolic bone disease and results in ossifications of connective tissue in the spine and in other places of the body. In the spine, it is visible as a candlewax-like bone formation on the right side of the vertebral column, connecting two or more vertebrae together (Fig. 9) It is hypothesised that the bone formation is limited to the right side since the aorta, the largest blood vessel in the human body, runs to the left of the vertebrae. The pulsating of this main artery results in constant movement of the tissue on the left side and thereby prevents ossification.<sup>34</sup> The extra-spinal lesions in the form of bony spurs are often located on the patella and calcaneus, but those can occur throughout the skeleton.

While it is known that DISH is more common in males and that the prevalence increases with age, the cause of this disease is not well understood. DISH however appears to be associated with a wealthier lifestyle since it seems to be linked to a high body mass and diabetes mellitus type 2.<sup>35</sup> In the archaeological record, this pattern is present as well, as DISH is particularly common in monastic populations. For example, 100% of the canons interred in the *Stiftskapel* in Maastricht demonstrated the classic skeletal lesions associated with DISH.<sup>36</sup> Considering that all the individuals were clergy who were likely to have led a more privileged life, this fits well with clinical observations. Even though the prevalence in the Kampen collection is not particularly high, it is interesting because you would not expect the *arme ellendigen* in the infirmary to have a wealthy lifestyle with an associated rich diet. It is, however, possible that the individuals with DISH in this skeletal population represent the *proveniers*. Considering that they had to pay to be cared for, it is possible that led a richer lifestyle before being admitted, which may have continued during their stay in the infirmary.

### Discussion and conclusion

The excavation at the St. Gertrude complex revealed traces of the infirmary hall, chapel and cemetery. The historical data suggest that mainly the poor and passers-by were cared for in this infirmary, but that later, *proveniers* were also admitted. The skeletal data is in line with what is known historically. The prevalence of infection is high as are the cases of traumatic injuries, an observation which fits

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33 De Jonge & Baetsen 2013, 240.

34 Waldron 2009, 73-77.

35 Van der Merwe *et al.* 2012, 203.

36 Janssen & Maat 1999, 15.



Fig. 9: DISH in thoracic vertebrae with clear ossification on the right side of the spine.

with the results from other infirmary datasets. The presence of DISH may suggest that the *proveniers* had a richer life style than the other residents in the infirmary. In comparison with regular skeletal collections (i.e., not infirmary assemblages), some interesting differences can be noted. Firstly, the demographic composition of this population is different than that of parish church cemeteries from the same time period. In comparison, for example, with the demographic composition of the medieval skeletal collections from Alkmaar<sup>37</sup> and Dordrecht,<sup>38</sup> it is clear that sex and age-at-death distribution in the Kampen collection are aberrant. In both Alkmaar and Dordrecht, the number of men versus women is much more equally distributed and also the age-at-death distribution is more regular. This is most likely the result of the fact that the Kampen skeletal collection is not a reflection of the general population. It reflects individuals who died in the infirmary and were buried in its cemetery. It is interesting, however, that there appear to be similarities between the Kampen collection and other infirmary populations.

With regards to pathological conditions, it is very difficult to comment on the differences and similarities, mainly because there are only a limited number of diseases that leave marks on the skeleton. Most fatal conditions do not leave skeletal lesions, therefore, individuals without lesions may be those in whom the disease progressed quickly.<sup>39</sup> All diseases and traumatic injuries that were found in the Kampen collection are also present in regular cemetery collections. The prevalence of infection appears to be high in the Kampen collection in comparison with other skeletal assemblages, but since this is not the case in other hospital collections, this cannot be regarded as an osteological signature of an infirmary collection. Therefore, the answer to the question posed in the introduction whether hospital patients are recognisable through demographic and palaeopathological characteristics, has to be no. While demographically there appears to be a pattern, it is clear that pathologically there is no such thing as an osteoarchaeological signature of an infirmary population.

37 Schats 2016, 91.

38 Maat *et al.* 1998, 17.

39 Also known as the osteological paradox. See Wood *et al.* 1992.



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