Smoke on the water of the North Sea. Osteological research of pipe smoking in the Post-Medieval Low Countries, Great Britain, and Ireland.

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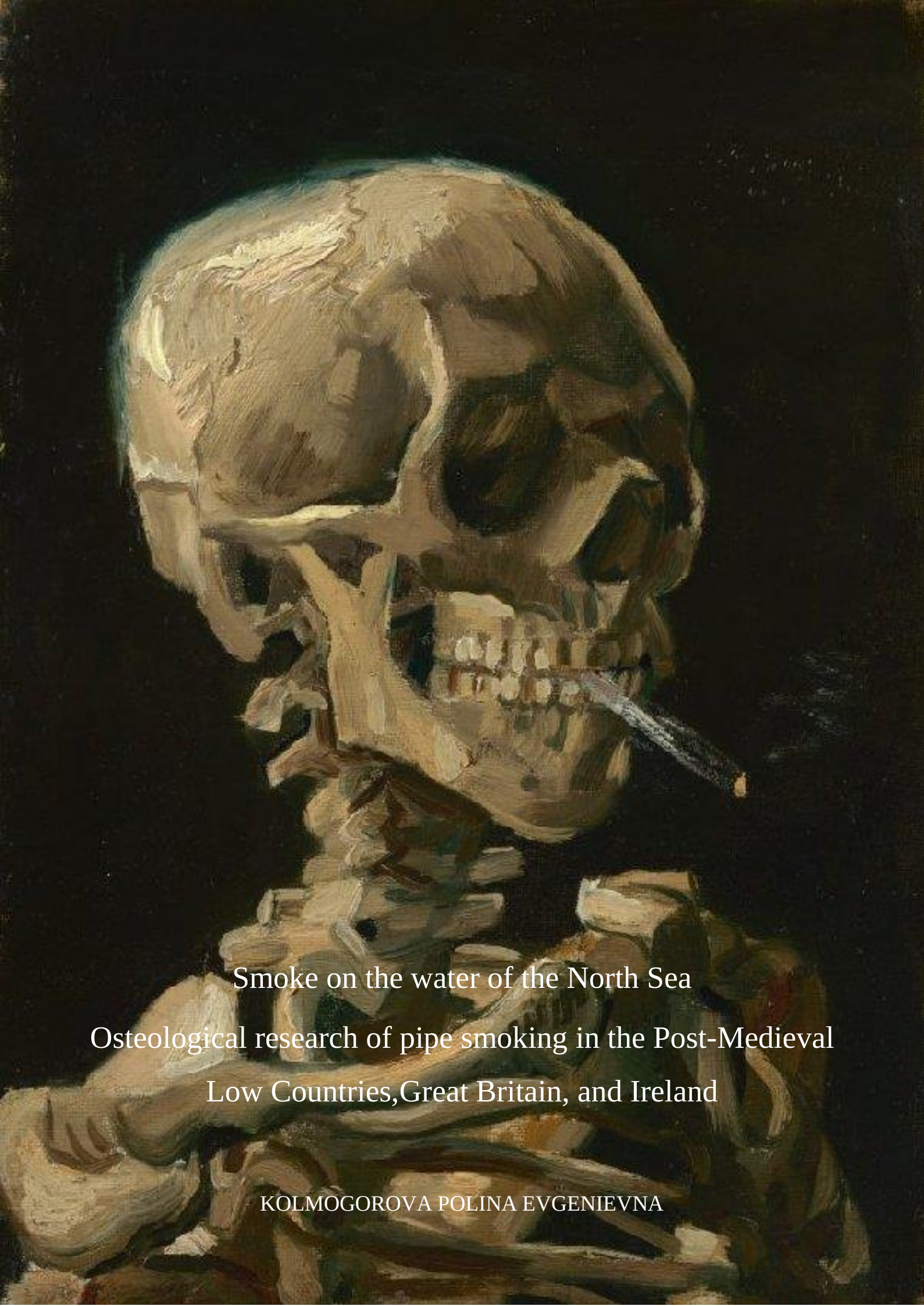

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Osteological research of pipe smoking in the Post-Medieval Low Countries,Great Britain, and Ireland

KOLMOGOROVA POLINA EVGENIEVNA

Cover image: Head of a Skeleton with Burning Cigarette (Dutch: Kop van een skelet met brandende sigaret) by Vincent Willem van Gogh (1886) from Van Gogh Museum, object number s0083V1962, https://www.vangoghmuseum.nl/en/collection/s0083V1962.

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Table of contents

List of figures

List of tables

List of appendices

Chapter 1. Introduction

Nowadays, it is hard to imagine a world without tobacco smoking, one of the most addictive habits that has become increasingly popular across every socioeconomic group in Western Europe (Inskip & Joy Muir, 2023, p. 157). This all-absorbing characteristic of tobacco consumption explains the current growing interest of scientists in the field of tobacco consumption, both in the present and in the past.

The origin of tobacco is still undetermined, but many scholars agree that approximately 8,000 years ago, two species of tobacco—*Nicotiana tabacum* and *Nicotiana rustica*—were distributed by indigenous peoples throughout the American continents, and no one outside of the Americas knew about them until the very end of the 15th century (Goodman, 2005, p. 2). After the first Columbus travel in 1492, people from outside the Americas learned about tobacco. The continued journey of tobacco from Latin America to the European continent started in the middle of the 16th century, when networks connecting Europe, North and South Americas, and the Caribbean became more extensive and intricate due to the context of Atlantic colonial history (Schreuder, 2018, p. 3). According to Schreuder (2018, p. 2), among the possible driving factors behind the subsequent development of these networks were increased economies and new technological advances leading to increased production efficiency and mobility. Together, these factors formed favorable conditions for merchants and sailors, who started to play crucial roles in the nascent colonial trading system, which developed alongside the plantation-slave economy of the Atlantic and Caribbean and the staple markets of big European cities such as Antwerp, Amsterdam, and London (Schreuder, 2018, p. 4). In these historical and economic conditions, tobacco was encountered by European colonizers, who later brought this herb to South and North-Western Europe (Hughes, 2003, p. 37).

Almost immediately after the introduction of tobacco to Europe, this herb started to be considered an effective medical herb (Sanchez-Ramos, 2020, p. 1). This happened because herbalists in Europe assumed that most New World plants were therapeutic since they had been used medicinally by native people, and, thus, by the end of the 16th century, tobacco had been adopted as a treatment for many illnesses throughout Europe (Sanchez-Ramos, 2020, p. 1). However, the following wider distribution of tobacco in the European community was uneven due to several factors. Firstly, the social stratification in North-Western European societies in the post-medieval period formed the conditions in which only relatively wealthy Europeans could afford tobacco during the first decades after its introduction (Hughes, 2003, p. 40). Secondly, some people, especially the followers of different religious movements like Puritanism or Protestantism, considered tobacco usage sinful since they were aware that many people continued smoking just for pleasure long after they had recovered from their ailment (Sanchez-Ramos, 2020, p. 2). They acknowledged the potential health benefits of tobacco but frowned upon its use for recreational purposes (Sanchez-Ramos, 2020, p. 2). Nevertheless, with time, tobacco smoking became popular among the various socioeconomic groups in many regions of North-Western Europe. According to Apperson (1914, p. 134), an important role in this process was played by the British monarchy, where during the 16th and 17th centuries, tobacco smoking was considered a recreational

social habit and a fashion trend. The popularization of tobacco was also favored by a tight contemporary European economy and by the establishment of an interconnected network (Hughes, 2003, pp. 48–56). This latter factor was a by-product of the emergence of political relationships between multiple European sovereign political structures, which in turn supported the comparatively easy spread of different cultural innovations all over the region (Hughes, 2003, pp. 48–56).

1.1 Research problem

The widespread commonality of tobacco consumption, which according to Hughes (2003, p. 46) was established after the 17th century, explains why there have been many attempts to study the tobacco smoking practices of cultures that were long gone and, through this, obtain a better understanding of people in the past. Generally, there have been two main methods of studying tobacco consumption: through the application of written historical sources and through archaeological investigations.

Among the recently published research with a primary focus on the historical study of tobacco smoking is an article by Bell (2008), in which the scholar describes the history of tobacco in England, with special attention being paid to the different uses and perceptions of tobacco. Despite the comprehensive use of multiple written sources, this study has one noticeable feature that also determines its limitations: the author focuses on the analysis of historical data from only written sources, which are susceptible to biases. The information collected from ancient written sources should be considered with a great deal of skepticism because authors usually describe events and involved people through their own preconceived notions of the world's fundamental characteristics (McCullagh, 2000, p. 64). This bias leads to prejudices toward certain events, people, and their behavior (McCullagh, 2000, p. 64). Moreover, not only the sources but also the work of the scholars is prone to bias since people who study history also write from their own cultural perspective (McCullagh, 2000, p. 64).

The less biased alternative to these studies is the investigation of tobacco consumption with the application of archaeological methods, which, although having their own drawbacks, still provide us with a better understanding of the past. For instance, in a recent journal article by Working (2022), the author presents the results of an archaeological and anthropological investigation of the impact of the early colonization of the Americas on fostering the rise of smoking among the English aristocracy (Working, 2022, p. 33). Although this narrow focus is beneficial for obtaining the most accurate data regarding the smoking habit among wealthy English men, the broader perspective, which could provide more information regarding the external influences and the impact of developed interactions, as well as internal reflections on the habit among different socioeconomic backgrounds, is missing. Another interesting paper is an article by Lemire (2018) in which the author describes the nature of the worldwide distribution of the originally "British thing"—a clay tobacco pipe. The scholar claims that tobacco pipes are important archaeological evidence of the early expansion of imperialism, cross-cultural commerce, and cultural appropriation (Lemire, 2018, p. 759). The study of tobacco pipes in an archaeological context is a sophisticated field of research. However, there are also some limitations

associated with this study: tobacco pipes do not accurately reflect the prevalence of tobacco smoking. According to Inskip and Joy Muir (2023, p. 157), there are at least two alternative ways of using tobacco pipes. In addition to smoking, pipes could be utilized as weapons and in medicine (Inskip & Joy Muir, 2023, p. 157). Moreover, excavated tobacco pipes do not reflect the exact number of people who were smoking tobacco because people could use more than one pipe during their lifetime or use alternative methods of tobacco consumption such as chewing or snuffing (Orser, 2000, p. 65). Overall, these papers demonstrate that while there are multiple studies of tobacco smoking, both from a historical and archaeological perspective, they do not necessarily reflect a good understanding of who were these people who were smoking or how common this habit was. Moreover, these works lack a Cross-European perspective, which would demonstrate the potentially varying prevalence of this practice associated with local cultural traditions.

Therefore, to remedy the currently lacking understanding of post-medieval smokers and the missing Cross-European perspective, this thesis presents an archaeological study on the prevalence of pipe smoking habits in independent but significantly related areas in North-Western Europe in the post-medieval period from the 16th to the 19th centuries. These geographical areas—Great Britain, Ireland, and the Low Countries, more specifically, the Netherlands and Belgium—are historically, economically, and politically interrelated with each other, and together they significantly contributed to the spread of the tobacco culture (Goodman, 2005, pp. 38–68). Through the examination of the multiple osteological reports from the post-medieval sites located in the chosen research area, it is possible to estimate the trends in pipe smoking practice related to socioeconomic, demographic, and cultural differences. To estimate the commonness of pipe smoking, the main focus of this thesis is on the prevalence of an indicator of the continuous habit of pipe smoking, the so-called pipe notches or pipe facets, which emerge as a consequence of years of consistent holding of a clay pipe between the front teeth, which results in semi-circular concave wear on teeth (Velsko et al., 2022, p. 140). Although there were many different ways of consuming tobacco, such as chewing or snuffing tobacco, many scholars agree that smoking tobacco through a clay pipe was the most popular technique in post-medieval North-Western Europe (Inskip et al., 2023, p. 11; Orser, 2000, p. 65). Furthermore, the chewing and snuffing of tobacco rarely leave any marks on human remains that can be traced without the application of microscopically and bimolecular approaches, which are often more expensive than a macroscopic approach (Inskip et al., 2023, p. 11). Therefore, this thesis is focused on the research of male-female patterns, their relationship with socioeconomic status, and national and international contexts that may have influenced the prevalence of pipe notches.

1.2 Research question and sub-questions

The main research question is logically derived from the aforementioned problem and covers all of its aspects.

1. What demographic and socioeconomic patterns can be observed in the tobacco pipe smoking habit in Great Britain, Ireland, and the Low Countries, and how do they compare?

To answer the main question, several sub-questions have been devised. In these questions, a distinction has been made between age and sex, high and low socioeconomic groups of populations from different countries, which are also compared between each other.

a) What is pipe notch prevalence in individuals from Great Britain, Ireland, and the Low Countries, and what differences can be observed?

b) What demographical trends in terms of sex and age groups in pipe prevalence can be observed in individuals from Great Britain, Ireland, and the Low Countries, and what differences can be observed?

c) Are there any differences in the presence of pipe notches between individuals with different socioeconomic statuses?

1.3 Approach

To obtain an overview of pipe smoking habit similarities and differences in Great Britain, Ireland, and the Low Countries, this research is focused on eight post-medieval skeletal collections with data on pipe notches, which comes from multiple archaeological reports, articles, and books. For Great Britain, an article by D. Walker and M. Henderson (2010) about the excavation of a cemetery in London and a book by M. Brickley et al. (2006) about the excavation of a cemetery in Birmingham, England, are chosen to be used. For Ireland, I have used data on the excavations in Kilkenny and Spike Island described in the articles of J. Geber and E. Murphy (2018) and J. Geber and B. O'Donnabhain (2020). For the Low Countries, I use the data from the sites of Alkmaar and Den Haag in the Netherlands described in the reports by S. Baetsen and P. Bitter (2001) and A. Pavlović and M. van Veen (2021), respectively. For the Belgian region, the reports that are used were written by S. Depuydt (2013) for the excavation in Mechelen and by J. van Kampen et al. (2022) for the excavation in Kruishoutem.

The main method of my research is the analysis of data from osteological reports, focusing on the presence or absence of pipe notches. I will analyze the number of individuals with and without pipe notches and show the findings by sex and age groups. These results are then compared across the different sites and countries. Finally, I investigate whether pipe smoking is a characteristic of lower or higher classes in these particular cases by dividing the collections by their burial contexts and socioeconomic statuses. Through an arrangement of these patterns, it is possible to reach a better understanding of the social and cultural aspects of the pipe smoking habit in post-medieval Europe.

1.4 Thesis outline

The chapter that follows this introduction provides context for the research and methods of this thesis by demonstrating background information on the history of tobacco's introduction to Europe and its further spread,

as well as pipe smoking traditions specifically. A particular emphasis is placed on the demonstration of the main similarities and variations between historical and cultural differences that might have influenced the prevalence of pipe smoking in the studied societies. Chapter 3 presents the materials and methods of this thesis, in which the background of the sites and the methods used for the data analysis and collection will be presented. In Chapter 4, the results are presented by the site, after which comparisons are made. After this section, Chapter 5 is dedicated to a discussion and interpretation of the obtained results. An attempt is made to place the explanations on a local scale and in a broader North-Western European context. Finally, Chapter 6 provides a conclusion with the answers to the research question and sub-questions. It concludes with some recommendations for future studies that may be done in this field of study.

Chapter 2. Background

The European history of one of the most influential substances started at the end of the 15th century, when sailors traveling from the Americas back to Europe took tobacco with them (Doll, 1998, p. 87). As a result of the wide variety of historical and cultural contexts in which tobacco has been used, there was a broad and changing range of opinions about the impact of tobacco smoking on human bodies. Different cultural groups had widely varying rates of tobacco use as well as different distributions of pharmacogenetic factors that attenuated its harmful consequences (Stolberg, 2007, p. 9). Therefore, tobacco consumption is a multifaceted issue that requires an examination of a wide range of cultural, historical, and demographic factors. Thus, in this chapter, an overview of the historical and cultural conditions of the introduction and subsequent popularization of tobacco in North-Western Europe is discussed, followed by a more detailed description of the history of pipe smoking in the four studied regions: Great Britain, Ireland, the Netherlands, and Belgium. At the end of the chapter, the indicator of continuous pipe smoking in the archaeological records that has been chosen for this research is described.

2.1 Introduction and subsequent spread of tobacco in Europe

Initially, tobacco was brought to Europe as a decorative plant (Sanchez-Ramos, 2020, p. 1). However, soon the plant was recognized as a medical herb, and by the end of the 16th century, the range of roles played by tobacco significantly expanded and started to cover also the sphere of leisure (Velsko et al., 2022, p. 137). This role expansion was happening parallel to the spatial expansion of tobacco throughout Europe. The spread of tobacco is an extensive research question that is still widely discussed. Most scientists agree that the sailors from Spain and Portugal were the first Europeans responsible for introducing tobacco to Europe (Brongers & Spill, 1964, p. 15; Hughes, 2003, p. 37; Stolberg, 2007, p. 23; Velsko et al., 2022, p. 130). However, the subsequent spread all over Europe raises more questions. According to Hughes (2003, p. 36), a significant role in the introduction of tobacco to Europe was played by Britain, where not only travelers and colonists were responsible for the spread but also various official figures such as Sir John Hawkins. Similarly, Brongers and Spill (1964, p. 32) claimed that Dutch sailors were introduced to the practice of smoking tobacco in the ports of England, where tobacco pipes were common, long before they reached the Netherlands. In contrast, in his research, Stolberg (2007, p. 30) suggested that tobacco found its way from Spain and Portugal first to the Low Countries, and from there, it spread to England by the second half of the 16th century. Although it might be impossible to determine the exact chronology of the spread of the tobacco smoking habit throughout Europe, what these papers indicate is the close interrelationship of continental and island communities in North-Western Europe in the early post-medieval period.

2.2 History of pipe smoking in Great Britain

Although there is no one widely accepted date among scholars for the introduction of tobacco to Great Britain,

it is clear that this introduction was linked to the commercial and evangelizing interactions between colonists and the indigenous populations of the Americas during the 15th and 16th centuries (Inskip & Joy Muir, 2023, p. 157; Lemire, 2018, p. 756). After the organization of more or less stable trade networks between the newly established colonies and Great Britain in the 16th century, tobacco consumption, especially through a pipe, became widely known (Hughes, 2003, p. 37). It is generally agreed that Sir Walter Raleigh was one of the responsible for popularizing tobacco smoking, especially among wealthy British citizens because he advocated for smoking to be seen less as a therapeutic treatment and more as a social habit (Hartnett, 2004, p. 135).

Nevertheless, the popularization of tobacco consumption among a wide audience took a couple of decades and was not without controversy. Before the 17th century, tobacco was very costly, and only wealthy British citizens could afford it (Hughes, 2003, p. 36). However, with time, the increased availability caused a drop in tobacco prices, and smoking could quickly spread across different socioeconomic groups (Hughes, 2003, p. 39). For instance, it is possible to find in historical sources that "tobacco engages both sexes, all ages, the poor as well as the wealthy; from the court to the cottage, from childhood to dotage, both those that are sick and the healthy" (Hughes, 2003, p. 40). Nonetheless, subsequently, tobacco smoking started to be associated with people of the working class. To a certain degree, this could be explained by the growing negative perception of this habit given by followers of religious movements such as Puritanism, who considered it sinful (Sanchez-Ramos, 2020, p. 1). Moreover, they worried that young people, in particular, might be harmed by tobacco smoking since, unlike other medical treatments, it was not limited to precise quantities at certain times of the day (Sanchez-Ramos, 2020, p. 4). Therefore, among the affluent, smoking started to be widely stigmatized for a long time, and only from the 1860s onwards was there a rapid expansion in the use of tobacco products among the upper classes in Britain (Walker & Henderson, 2010, p. 216).

In addition to the written sources, paintings may serve as frames through which we can observe, maybe not always the actual reality, but definitely some of the major cultural movements and transformations that were occurring in past societies. Unfortunately, the theme of tobacco pipe smoking in British paintings is not a common topic for research. Thus, there are hardly any studies dedicated to this topic. However, this lack of study can also reflect that it was uncommon for British art traditions to depict this behaviour. Still, it is possible to find some examples of British paintings with pipe smokers from the 18th and 19th centuries, such as the one in Figure 1. Usually, the paintings represent satirical depictions of smoking groups, and it is argued that these images reflect contemporaneous perceptions of “tobacco as an intoxicant in British associational life” (Roman, 2022, p. 130). However, what these paintings can also indicate is that smoking had become an incorporated social practice among wealthy British groups and was probably associated with clubbing, another widely acknowledged British cultural phenomenon (Roman, 2022, p. 147). It is important to mention that it is hardly possible to find paintings of smoking British women from the 17th-19th centuries. This might suggest that smoking in Britain was associated with exclusively masculine behavior and had a negative connotation for female smokers (Roman, 2022, p. 148).

Figure 1. A print by William Hogarth "A midnight modern conversation," 1733. An example of 18th century British art with the satiric representation of smokers.
(Metropolitan Museum of Art, museum number: 401582, https://www.metmuseum.org/art/collection/401582)

2.3 History of pipe smoking in Ireland

The introduction and popularization of tobacco smoking in Ireland were directly connected to the development of the smoking tradition in Great Britain. Shortly after Sir Walter Raleigh popularized the use of smoking pipes in Great Britain, he was granted permission to establish a plantation in Ireland (Hartnett, 2004, p. 135). Even though tobacco was expensive and hard to come by for most people, it is possible that Raleigh's presence in Ireland and his habit of smoking contributed to its further popularization and its acceptability as a social practice among people from Ireland's highest socioeconomic class (Hartnett, 2004, p. 135). With time, despite the fact that there were people who did not share the general approval and desire for tobacco, pipe smoking was integrated into the cultural traditions of Ireland (Hartnett, 2004, p. 137). However, due to the local historical and cultural conditions, a considerably different culture of tobacco smoking developed in Ireland compared to Great Britain. For instance, an integral part of the Irish burial ritual throughout the 18th and 19th centuries was the use of clay pipes, which were also occasionally interred with the deceased (Geber & O'Donnabhain, 2020, p. 176). Moreover, according to the traveling writers from the United States who visited Ireland in the late 19th century, at this time, wealthy and middle-class Irish men smoked less than those in the upper classes in England, but the opposite was evidently true for those with lower socioeconomic backgrounds (Geber & O'Donnabhain, 2020, p. 176). In addition, this widespread use of tobacco among low-income individuals could explain the formation of a stereotypical sign of belonging to the working class among the prosperous Irish citizens who avoided smoking in the 18th and 19th centuries (Geber & O'Donnabhain, 2020, p. 176). The colonial context of Irish-British relations could also play an important role in the spread of tobacco consumption. The practice of pipe smoking in Ireland throughout the late post-medieval period might be considered as a political act in relation to the development of social and national identity as a response to colonial oppression (Geber & O'Donnabhain, 2020, p. 176). According to this theory, smoking was an act of self-identification and an embodiment of anticolonial rhetoric (Geber & O'Donnabhain, 2020, p. 176).

In regards to the Irish paintings with pipe smokers, it might be difficult to make any claims because, during the medieval period, Irish art underwent a period of stagnation, after which it took a few centuries to recover and form new traditions (Verkerk, 2015, p. 150). Thus, there are not many works left and just a few papers written about this topic. The more or less well-studied paintings appeared only around the 19th century when many American painters who spent a sophisticated time in Ireland dedicated some of their works to the depiction of Irish traditions (Kinmonth, 2006, p. 103). According to the works of one of these painters - Howard Helmick - who depicted a lot of scenes in which Irish citizens smoked pipes in a casual atmosphere, it can be suggested that pipe smoking was a common practice among representatives from mostly middle and low socioeconomic groups (see Figure 2). Moreover, as can be seen in Figure 3, in his paintings, it is possible to find not only male smokers but also female Irish smokers.

Figure 2. A painting by Howard Helmick "The Gossips" 1877. An example of an American painting of Irish male smokers.
(Museums Sheffield, museum number: 18451907, https://artuk.org/artists/helmick-howard-18451907)

Figure 3. Another painting by Howard Helmick "Woman by the Hearth," 1875. An example of an American painting of Irish female smokers.
(Private collection. https://www.mutualart.com/Artwork/Woman-by-the-Hearth/10ED7E14CE17C165)

2.4 History of pipe smoking in Low Countries

The introduction of tobacco to the Low Countries and subsequent development of local markets and production were happening in the historical context of the Eighty Years War, or the Dutch War of Independence from Spain (Klooster, 2011, p. 17). It is not clear who first started smoking tobacco in the United Provinces, but the Spanish soldiers, who already had a well-developed habit of tobacco smoking, were probably among the first people to introduce tobacco to the Dutch population and laid the foundation for the association of tobacco with masculinity (Borodina, 2022, p. 58). Moreover, a fundamental role in the introduction of tobacco to the Low Countries was played by Great Britain. This cultural exchange had started with the massive movement of British citizens into Dutch and Flemish territory for military purposes after 1585 when the English Crown and the Dutch Republic signed the Treaty of Nonesuch, in which the former agreed to receive financial and military support from the latter in their fight against Habsburg Spain (Klooster, 2011, p. 17). Shortly after the signing of this agreement, Spain took Antwerp, the economic center where the British Merchant Adventurers had settled their base on the European continent (Klooster, 2011, p. 17). As a result, the Merchant Adventurers shifted their base from Antwerp to Rotterdam, which was becoming more important as a trading hub for

English merchants (Klooster, 2011, pp. 18–20). Moreover, there is historical evidence that indicates that some English settlers arrived in the Netherlands with the explicit goal of developing the country's tobacco industry because tobacco cultivation in England was outlawed in 1604 (Klooster, 2011, p. 22). Therefore, when English traders settled in the area, they quickly started the expansion of regional markets through the adjustment of the arrival of tobacco from the English colony in the West Indies to Dutch ports such as the one in Rotterdam and the development of the pipe industry in big commercial cities in the United Provinces and Flanders such as Amsterdam, Gouda, Haarlem, Ghent, and Liege (Brongers & Spill, 1964, p. 31; Klooster, 2011, p. 20). Especially important for this process was the provision of raw materials for the production of pipes from Flanders, where a large deposition of natural clay was quarried in Liege and Namur (Brongers & Spill, 1964, p. 37). Unfortunately, due to the significant limitation of the available information regarding the history of tobacco pipe smoking in Flanders, it is not possible to indicate any further details regarding this practice and its history in this region.

The British domination on the Dutch tobacco market started to be countered in the middle of the 17th century as a result of the Dutch Estates General's adoption of a policy allowing all United Provinces citizens to engage in commercial activity across the Caribbean Sea (Klooster, 2011, p. 20). The Dutch merchants quickly took over the maritime operations and started to play a crucial role in the tobacco trade (Klooster, 2011, pp. 27–30). This resulted in the development of more independent tobacco commerce in the Low Countries and a wider acceptance of tobacco smoking practices (Borodina, 2022, p. 60).

Among the first well-known Dutch smokers were male university students from the upper and middle socioeconomic classes (Roberts, 2006, p. 81). Many historians suggest that male students started the smoking trend due to the prevalence of "smoking" role models in the form of soldiers and foreign students from the United Kingdom (Klooster, 2011, p. 26; Roberts, 2006, p. 81). The former models were considered representatives of masculinity owing to their bravery on the battlefield and their reputation as heavy drinkers and smokers (Roberts, 2006, p. 85; Stolberg, 2007, p. 10). Thus, smoking started to be associated with adulthood and manhood in the minds of young students (Roberts, 2006, p. 82). However, by the end of the 17th century, smoking had become prevalent across all socioeconomic groups in the Low Countries (Roberts, 2006, p. 91). Once a trend reached its zenith and became popular, the encouraged production made tobacco abundant, and in the context of general economic growth, tobacco became more affordable for representatives of all socioeconomic groups (Roberts, 2004, p. 239). Furthermore, many scholars agreed that this widespread popularization of tobacco smoking could be explained by additional historical background: many people thought that tobacco smoke protected them against the plague pandemic in Amsterdam during the 17th century (Borodina, 2022, p. 70; Goodman, 2005, p. 74).

As it was already mentioned, the Low Countries and Great Britain were economically and socially connected areas during the post-medieval period. Therefore, it can be assumed that in Dutch paintings, we can find a similar pattern reflecting the prevalence of pipe smoking themes as the one discussed for Great Britain.

However, that is not the case because pipe smoking was an undeniable part of one of the most popular painting motives in Dutch paintings between the 16th and 18th centuries, tavern scenes (Borodina, 2022, p. 63). As can be seen in Figure 4, they were featured by the depiction of not the actual scenes from taverns but rather the over-exaggerated behavior of people to highlight the negative connotation of alcohol consumption, pipe smoking, and other "sins" (Borodina, 2022, p. 65).

Figure 4. A painting by Jan Havickszoon Steen "Tavern Scene," ca. 1661 – 1665. This painting is a good example of Jan Steen's genre themes where using traditional Dutch aphorisms as inspiration, he frequently included moral messages in his depictions of everyday life.
(The Thyssen-Bornemisza National Museum, museum number: CTB.1957.3, https://www.museothyssen.org/en/collection/artists/steen-jan-havicksz/tavern-scene)

Therefore, many Dutch paintings from the 17th century have a moralizing bent and depict smokers as marginal individuals (King, 2007, p. 8). This narrative can be explained by the Dutch Republic's dominant religions, Protestantism and Calvinism, which promoted moderation and generally condemned this kind of conduct (Borodina, 2022, p. 64). Moreover, this perception was considerably interrelated with the notion popular at the end of the 17th century, when many works of Dutch artists reflected a belief that smoking was associated with the lower classes and the peasant lifestyle (Borodina, 2022, p. 66). Nonetheless, although the majority of pipe smokers' depictions are related to a low class, as can be seen in Figure 6, it is paramount to mention that in genre paintings from the beginning of the 17th century, such as the one in Figure 5, we can find smoking figures from high society as well (Borodina, 2022, p. 67). These trends are similar to the historical ones described above.

Figure 5. A painting by Esaias van de Velde "Merry company banqueting on a terrace," 1615. This is an example of a depiction of wealth Dutch smokers.
(Staatliche Museen, museum number: AB90B91E7, https://www.mutualart.com/Artwork/AB90B91E7)

Figure 6. A painting by Jan Havickszoon Steen "A party of peasants," 1649. This is an example of a depiction of Peasant Dutch smokers.
(Detroit Institute of Arts, museum number: 553, https://arthistory.co/a-party-of-peasants-553)

Another interesting aspect of Dutch post-medieval painting traditions is that women were also quite often depicted with pipes. However, many of these paintings, such as Figure 7, were moralizing and serving for the negative depictions of female smokers because "tobacco use by women was considered as immoral behavior" (Snelders,2023, p. 21). However, there are also cases when the portrayals of smoking women do not represent a type of condemnation, as can be seen in Figure 8 (Goodman, 2005, p. 59).

Figure 7. A painting by Jan Havickszoon Steen "The Effects of Intemperance," 1663-1665. It is an example of the Dutch moralizing art with negative depiction of Dutch female smokers.
(National Gallery in London, museum number: 1275544, https://www.heritageimages.com/preview/1275544)

Figure 8. A painting by Gabriel Metsu "A woman seated smoking a pipe," 1650-1667. It is an example of a neutral representation of Dutch female smoker.
(Manchester City Galleries, museum number: 29025, https://www.vads.ac.uk/digital/collection/NIRP/id/29025)

Unfortunately, the situation with Flemish post-medieval art research is different because there are hardly any specific studies, given its frequent and only association with Dutch art. In spite of this, a conclusion that can be drawn from general comparative studies of Dutch and Flemish painting traditions in the 16th and 18th centuries is that a tobacco pipe was an accessory that was excessively contemporary for the classical and mythical settings that were favored by Flemish painters (Borodina, 2022, p. 70). As a result of this, it is uncommon to see a pipe depicted in the works of well-known Flemish painters like Peter Paul Rubens or Anthony van Dyck. However, there are exceptions to the rule. For instance, if we take a look at the paintings of David Teniers the Younger, who also made a few tavern scenes similar to their Dutch analogs, we can find a Flemish depiction of pipe smokers. Figure 9 shows that these Flemish works are excellent examples of close imitation of theoretical and pictorial ideas prevalent in Dutch art at the time (Cartwright, 2007, p. 202). Similarly to Dutch tavern paintings, Flemish artists were using pipes as symbols of living a life of ease to warn the audience that engaging in temporary sensational pleasures, such as smoking, could lead to negative consequences such as public reprimand (Mitchell, 1987, p. 27). However, in contrast to Dutch paintings, you can hardly find a lot of Flemish paintings in which smoking women are depicted, but there are a few works, such as the one in Figure 10.

Figure 9. A painting by David Teniers the Younger "Tavern Scene," 1658. This is an example of Flemish imitation of a Dutch tavern scene.
(National Gallery of Art, museum number: 55505, https://www.nga.gov/collection/55505)

Figure 10. A painting by David Teniers the Younger "Tavern Scene," 1658. This is an example of Flemish painting of a smoking woman.
(Private collection, https://www.wikiart.org/david-teniers-the-younger/a-man-and-woman-smoking)

2.5 Smoking evidence in the archaeological record

Overall, it is clear from the historical records that smoking had obtained a prominent position in the lives of the post-medieval citizens of North-Western countries, though differences between the areas appear to exist. Therefore, it can be claimed that this popularity, together with the capacity of tobacco to make people addicted to smoking, set the stage for the emergence of individuals who smoke pipes on a regular basis. The consequences of this habit are identifiable in the archaeological record (Romanowski, 1996, p. 170).

As it was mentioned before, the primary focus of this thesis is on pipe notches. Figure 11 and Figure 12 show examples of pipe notches, which occur in the teeth when they are worn down by a smoking pipe used at the area where tooth-to-tooth contact occurs (Walker & Henderson, 2010, p. 209). These semi-circular cavities, recognizable on at least two but usually four teeth, are the result of repeated practice of holding clay pipe stems between the teeth (Walker & Henderson, 2010, p. 217).

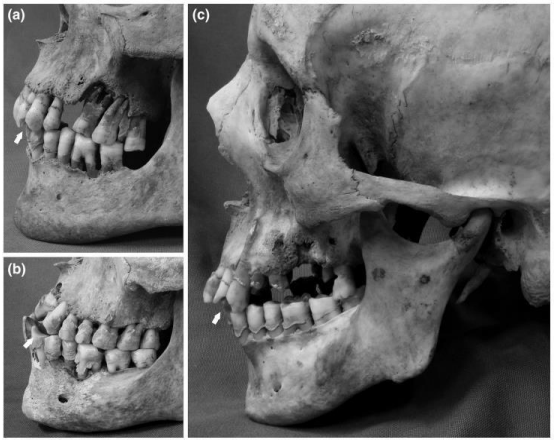


Figure 11. The examples of pipe notches among adult male individuals excavated from Kilkenny Union Workhouse in Ireland (after Geber & Murphy, 2018, p. 10).

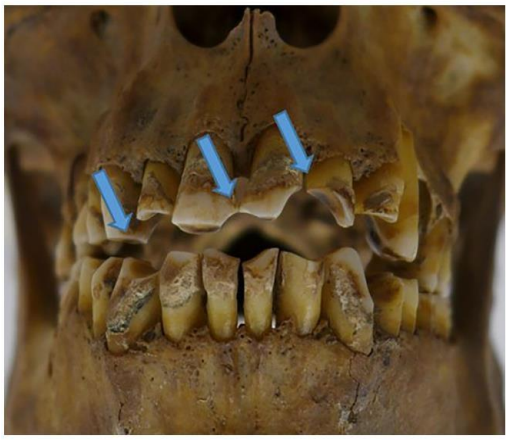


Figure 12. A male individual from 19th century burial in Middenbeemster with three pipe notches (after Inskip et. al., 2023, p. 7).

These tooth deformations are particularly useful for the estimation of pipe smoking prevalence because they are unlikely to be due to other causes, which makes them a reliable indicator of the continuous practice of pipe smoking (Meyer et al., 2011, p. 205).

There have already been studies associated with pipe notches that demonstrate the workability of this approach. For instance, the recent study of two sites in the Netherlands—Klaaskinderkerke and Beemster—was focused on the estimation of the correlation between pipe smoking and the dental health of male individuals in post-medieval rural Netherlands (Inskip et al., 2023, p. 1). A group of scholars compared the rates of dental diseases and pathologies such as pipe notches in Klaaskinderkerke, which is dated to the period before tobacco introduction to the Netherlands, and Beemster, which is dated to the period after tobacco introduction (Inskip et al., 2023, p. 3). They concluded that pipe smoking might be inferred to have been associated with a decline in oral health (Inskip et al., 2023, p. 11). In addition, this research also illustrates that the method of studying the pipe notches is productive and reliable.

Another recent study carried out also in the Netherlands was at St. Andrew's Church in Hattem. The focus of the research was on differences in the osteological data collected from individuals from the different sides of St. Andrew's Church, which might indicate the differences in the socioeconomic backgrounds of the buried individuals (Veselka & Klomp, 2019, p. 139). It was a common practice in North-Western Christian burial traditions to give the space inside the church as the most valid place for people with high status and the churchyard around for people with lower socioeconomic status (Veselka & Klomp, 2019, p. 139). The results of the research demonstrate that despite the historical evidence that St. Andrew's Church was used by people from different socioeconomic backgrounds, the findings of the osteoarchaeological investigation were not statistically significant to associate the individuals from the least valid part of the churchyard with the lowest socioeconomic classes (Veselka & Klomp, 2019, p. 150). Moreover, one of the results of the research was the estimated prevalence of pipe notches among individuals from different sides of the churchyard. According to the scholars, the high prevalence of pipe notches recorded at this site in association with other osteological markets of status indicated that this cemetery was not used by representatives of high socioeconomic groups (Veselka & Klomp, 2019, pp. 150–151). This research demonstrates that the correlation between the prevalence of pipe notches and socioeconomic status is representative and, thus, a workable method of study.

Chapter 3. Materials and methods

This chapter starts with a description of the general background of the cemeteries used in this research. For each burial site, contextual information is provided, including an overview of the excavations conducted there, the general results of the osteological research, such as an overview of the estimated demographic statistics of each population, and a description of the methods applied for the estimation of the socioeconomic background of the studied individuals. Then, the chapter continues with an exposition of the methods used by osteologists for the estimation of age-at-death, sex, dental analysis, and scoring pipe notches. Lastly, the techniques used for data analysis are presented.

3.1 Materials: Great Britain

3.1.1 Cemetery of St. Martin's Churchyard in Birmingham

The excavation of St. Martin's Churchyard in Birmingham, England, was carried out in 2001 (Brickley et al., 2006, p. 29). As a result of this project, 857 burials were found (Brickley et al., 2006, p. 29). According to archaeological and historical evidence, the churchyard was continuously used from the 12th to the 19th centuries, but the extensive utilization of the graveyard significantly influenced the preservation of the burials (Brickley et al., 2006, p. 29). Therefore, most of the preserved burials are dated to the late 18th and 19th centuries (Brickley et al., 2006, p. 29). Additionally, osteologists did not examine all excavated remains because they only chose those with the highest level of preservation for the analysis (Brickley et al., 2006, p. 3). Thus, there is a detailed description of the conducted analysis for 505 individuals from St. Martin's Churchyard (Brickley et al., 2006, p. 3).

As can be seen in Figure 13 and Figure 14, the demographic pattern of studied individuals from St. Martin's Churchyard is diversified. 140 individuals, or 28 % of the studied remains, were identified as males, and 96 individuals, or 19 % of the studied remains, were identified as females (Brickley et al., 2006, p. 76). The biggest age group in this population is of non-adult individuals, which includes 30 % of all studied remains, and the smallest is the age group of adults or individuals whose age-at-death could not be accurately estimated (Brickley et al., 2006, p. 76).

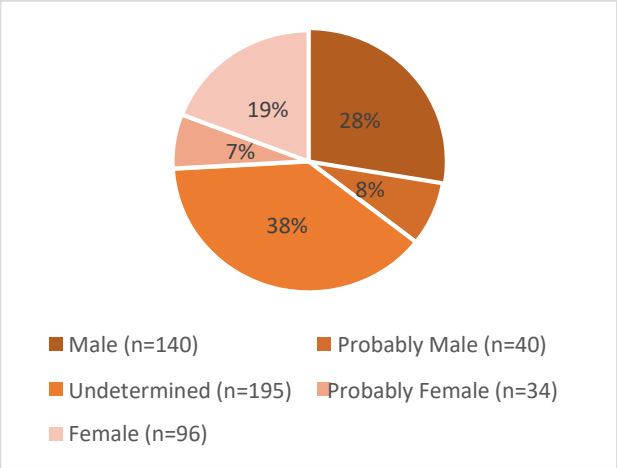


Figure 13. Distribution of sex in the population of St. Martin's Churchyard (after Brickley et al., 2006, p. 76).

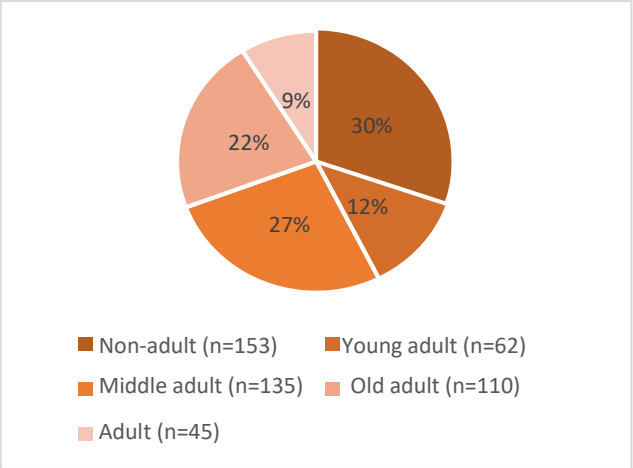


Figure 14. Distribution of age-at-death in the population f St. Martin's Churchyard (after Brickley et al., 2006, p. 76).

A characteristic feature of St. Martin's Churchyard is that it was used by representatives of all socioeconomic groups in Birmingham, and the excavated burials represent a cross-section of Birmingham's population in the period of one of the main social transformations in British history—the Industrial Revolution (Brickley et al., 2006, p. 3). Therefore, additional archaeological data is required for the estimation of the socioeconomic background of the studied individuals. Firstly, the typology of the burials is an informative indicator: 734 individuals were found in simple earth-cut graves, but the rest were buried in elaborate structural types, such as in a large chambered vault (Brickley et al., 2006, pp. 25–29). It can be suggested that the individuals in the earth-cut graves represent the recently established working class, and the individuals from more sophisticated burial structures represent the upper and middle classes (Brickley et al., 2006, p. 3). Another indicator is the location of a burial at the cemetery: burials inside the church were usually for wealthy citizens because it was considered the best location, and the nearer to the altar, the better (Brickley et al., 2006, p. 15). At the same time, burials outside the church were usually for lower socioeconomic strata (Brickley et al., 2006, p. 15).

3.1.2 Cemetery of St. Mary and St. Michael Church in London

The other British site included in this study is located at Lukin Street in the East End of London, England. The location of both British sites is indicated in Figure 15.

The excavation of the cemetery of St. Mary and St. Michael was carried out in 2005 and 2006 (Walker & Henderson, 2010, p. 210). The excavation of 745 skeletal contexts yielded a total of 705 identified individuals, which were studied by osteologists (Walker & Henderson, 2010, p. 210). All of these individuals are dated to the middle of the 19th century because, according to the historical evidence, this churchyard was opened from 1843 until 1854 (Beaumont et al., 2013, p. 88).

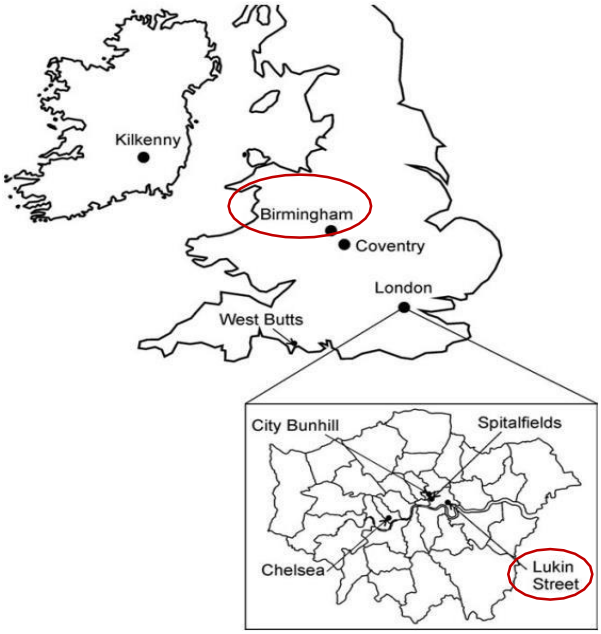
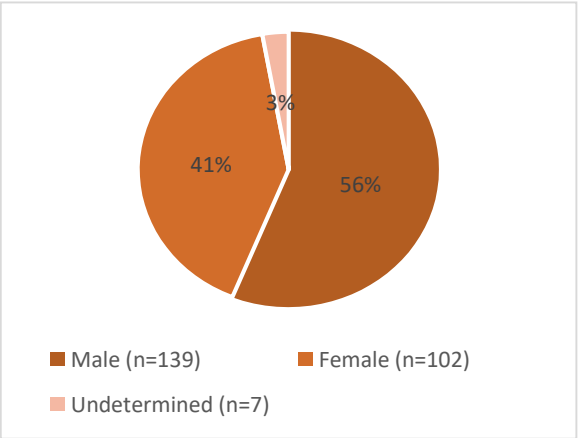


Figure 15. A map of Britain, showing the location of Lukin Street, where St. maria and St. Michael Church islocated, and the location of the city of Birmingham where the St. Martin Church is located (after Beaumont et al., 2013, p. 88).

As can be seen in Figure 16, there were approximately as many identified male individuals (139, or 56 %) as identified female individuals (102, or 41 %) from the cemetery of St. Maria and St. Michael Church in London. Moreover, although Figure 17 shows the age group of non-adults is significantly bigger than the age group of adults, it is important to mention that sex was estimated only for the 268 adult individuals.



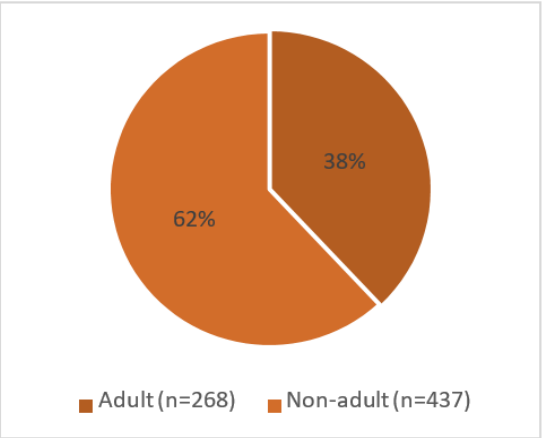


Figure 16. Distribution of sex in the population of St. Maria and St. Michael Cemetery (after Walker & Henderson, 2010, p. 211).

Figure 17. Distribution of age-at-death in the population of St. Maria and St. Michael Cemetery (after Walker & Henderson, 2010, p. 211).

According to the historical evidence, it can be suggested that the buried individuals from this cemetery belonged to a single cultural and socioeconomic group of poor Irish immigrants who found new opportunities in London's ports and construction sites, contributing to the growth of an already sizable Irish population in

the city during the Great Famine of 1847–1848 (Walker & Henderson, 2010, p. 216). Therefore, the cultural background of these representatives of the working class should not be ignored. As it was mentioned before, the 19th century Irish population already had a well-developed tradition of pipe smoking. Hence, it can be suggested that these people brought their traditional leisure time activity with them to London, contributing to the growing belief of the 19th century population of Great Britain that tobacco consumption was a communal aspect among the low socioeconomic classes (Hilton, 2000, p. 32).

3.2 Materials: Ireland

3.2.1 Cemetery of the workhouse in Kilkenny City

One of the biggest mass burial sites ever discovered via archaeological investigation was found in the Irish city of Kilkenny (Geber & O'Donnabhain, 2020, p. 160). As a result of an excavation that started in 2005, at least 970 human skeletons were discovered from 63 burials (Geber & O'Donnabhain, 2020, p. 165). These burials can all be dated to the middle of the 19th century because, according to historical sources, they are all related to the highest mortality peak during the Great Irish Famine, which happened between 1845 and 1852 (Geber & O'Donnabhain, 2020, p. 165). During these years, multiple workhouses similar to the one in Kilkenny were built in Ireland as a reaction by the British government to the deteriorating socioeconomic situation in Ireland (Geber & O'Donnabhain, 2020, p. 165).

The demographic statistics from Kilkenny Union Workhouse Cemetery in Figure 19 demonstrate that there were almost as many non-adult individuals as adults. Nonetheless, the results of sex estimation presented in Figure 18 reflect only statistics for 425 adult individuals because sex was not estimated for a larger age group of non-adults (Geber, 2015, p. 65). Based on the data from the report, 192, or 50 % of the adults were males, whereas 171, or 45 % were females.

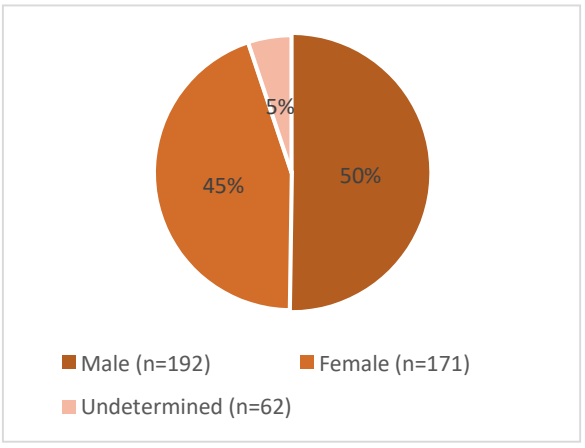


Figure 18. Distribution of sex in the population of Kilkenny Union Workhouse Cemetery (after Geber & O'Donnabhain, 2020, p. 161).

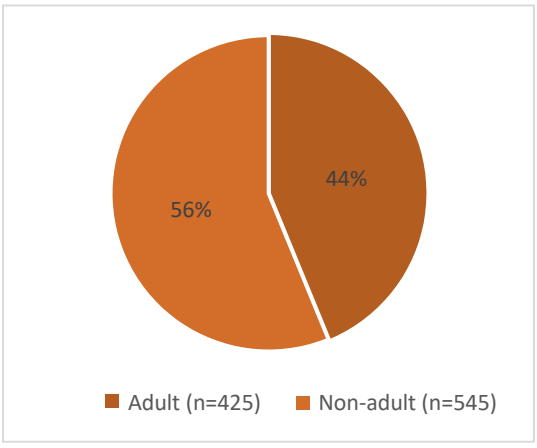


Figure 19. Distribution of age-at-death in the population Kilkenny Union Workhouse Cemetery (after Geber & O'Donnabhain, 2020, p. 161).

According to a historical context of general economic instability, geopolitical marginalization, and increased poverty not only in Kilkenny but all over Ireland during the Great Irish Famine, it can be suggested that people who lived in this workhouse and were buried in this cemetery were representatives of middle and low socioeconomic groups in Ireland and who were severely affected by pauperism (Geber, 2015, p. 24). In addition, it is important to mention that 19th century Ireland was significantly connected with Great Britain, and the former's experience of imperial power played a significant role in the formation of local independent cultural traditions (Geber & O'Donnabhain, 2020, p. 161). This context is paramount for understanding a recently conducted osteological analysis and its results.

3.2.2 Cemetery on Spike Island

The second Irish archaeological site studied for this research is located on Spike Island in Cork Harbor. The location of both Irish sites is indicated in Figure 20.

Despite the relatively small size of the cemetery, over 2,300 individuals were imprisoned on the island by the middle of the 19th century, making it the biggest jail in the United Kingdom at the time (Geber & O'Donnabhain, 2020, p. 166). The local cemetery was excavated between 2013 and 2018, and more than 200 individual graves were found (Urbanus, 2020, p. 53). However, only the remains of 26 individuals have been studied by osteologists so far (Geber & O'Donnabhain, 2020, p. 166). Spike Island Cemetery was associated with a fort that was utilized as a jail for Irish convicts in the late 19th century to help relieve the strain on the municipal facilities throughout Ireland caused by the Great Famine, which allowed the completion of the Spike Island defences by providing an unpaid workforce (Geber & O'Donnabhain, 2020, p. 176). Therefore, the burials can be dated to the period of the Great Famine and at the time when prisoner mortality was greatest on the island, between the years 1860 and 1883 (Geber & O'Donnabhain, 2020, p. 178).

The demographic statistics of the studied human remains are rather homogenous: all osteologically analysed remains were adult male individuals, even though there was historical evidence that among the prisoners were non-adults (Geber & O'Donnabhain, 2020, p. 167; Urbanus, 2020, p. 62). In addition, according to historical sources, these individuals had an exclusively low socioeconomic background. This jail was established as a crisis reaction in response to the spike in crime because the legal system severely penalized stealing at the time of the Great Famine and significant shortages in food supplies (Geber & O'Donnabhain, 2020, p. 178). Among the individuals who were most significantly affected by this situation were predominantly the poorest individuals (Geber & O'Donnabhain, 2020, p. 178).

Figure 20. Map of Ireland showing Kilkenny City and Spike Island (after Geber & O'Donnabhain,2020, p. 161).

3.3 Materials: The Netherlands

3.3.1 Cemetery of the Grote Kerk in Alkmaar

The first studied site from the Low Countries is located in Alkmaar, The Netherlands. The parish church of St. Lawrence, which is often referred to as the Grote Kerk, was excavated between 1994 and 1995 (Baetsen & Bitter, 2001, p. 73). As a result of this excavation, approximately 1000 skeletons were found (Baetsen & Bitter, 2001, p. 85). However, not all excavated remains have been studied by osteologists. So far, osteological analyses have been carried out on 250 individuals buried inside the church (Baetsen & Bitter, 2001, p. 85). Moreover, according to the historical sources, including grave registers with a collection of data about each burial now housed at Alkmaar's historical archives, it can be suggested that all burials are dated to the 18th and 19th centuries (Baetsen & Bitter, 2001, p. 85).

The demographic statistics of the Grote Kerk population are presented in Figure 21 and Figure 22. Similarly to other sites, the sex was not estimated for non-adult individuals, but for adult individuals, the sex was estimated in 99.5 % of cases (Baetsen & Bitter, 2001, p. 85). It is essential to highlight that in this population, there were slightly more females (105 individuals, or 53 %) than males (89, or 46 %) (Baetsen & Bitter, 2001, p. 85).

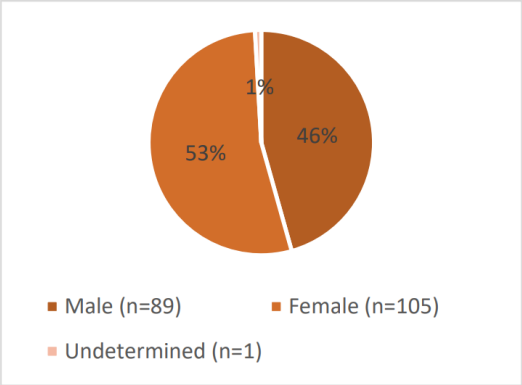


Figure 21. Distribution of sex in the population of Alkmaar GroteKerk Cemetery (after Baetsen & Bitter, 2001, p. 27).

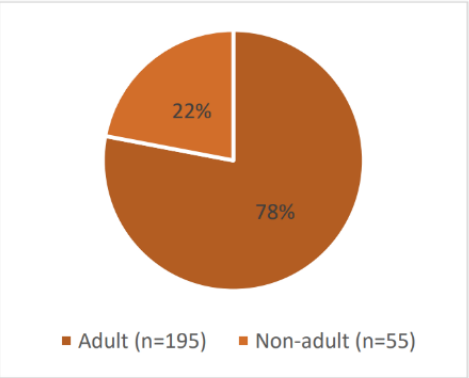


Figure 22. Distribution of age-at-death in the population of Alkmaar Grote Kerk Cemetery (after Baetsen & Bitter, 2001, p. 27).

In regards to the socioeconomic status of the excavated individuals, it can be claimed that all of them represented a wealthy part of the Alkmaar population (Baetsen & Bitter, 2001, p. 85). According to archaeological and osteological analysis, the absence of signs of severe physical labor among the analyzed individuals, the general trend of the low prevalence of diseases, a comparatively high estimated median age at death, as well as the fact that all these remains were excavated from the inside of the church, which was usually used by wealthy citizens, allow us to claim that all studied individuals had a high socioeconomic status (Baetsen & Bitter, 2001, p. 75).

3.3.2 Cemetery of the Grote Kerk in Den Haag

The other studied Dutch site is located in South Holland. The cemetery around the Grote Kerk, or St. Jacobskerk, in Den Haag was excavated in 2017 (Pavlović & van Veen, 2021, p. 9). During this excavation, 244 burials were found, but only the remains of 171 individuals with a sufficient level of preservation were subsequently studied by osteologists (Pavlović & van Veen, 2021, p. 42). The burials can be dated to the 16th and 17th centuries (Pavlović & van Veen, 2021, p. 42). Although the cemetery around the church was functioning since the 13th century all the way till 1681, scholars agree that the likelihood of discovering traces of older burials inside and outside the current church is extremely low as a result of the activities associated with the expansion of the church, combined with the digging and clearing of graves (Pavlović & van Veen, 2021, pp. 61-62).

Figure 24 demonstrates that most of the analysed individuals were identified as non-adults. At the same time, Figure 23 shows that 15 individuals, or 31 % were estimated to be males and 16, or 33 % were estimated to be female. However, it is essential to mention that sex was estimated for only 48 adult individuals with sufficient preservation (Pavlović & van Veen, 2021, p. 188).

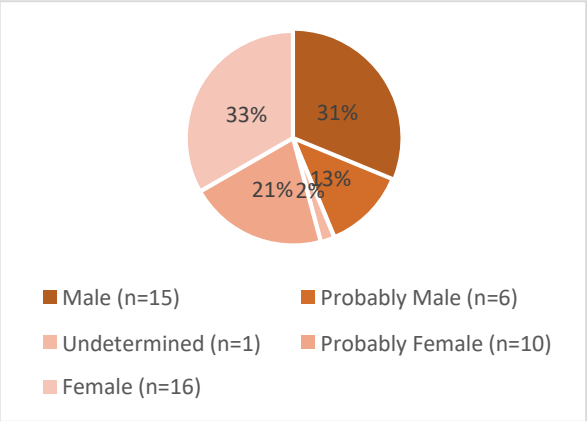


Figure 23. Distribution of sex in the population of Den Haag GroteKerk Cemetery (after Pavlović & van Veen, 2021, p. 188).

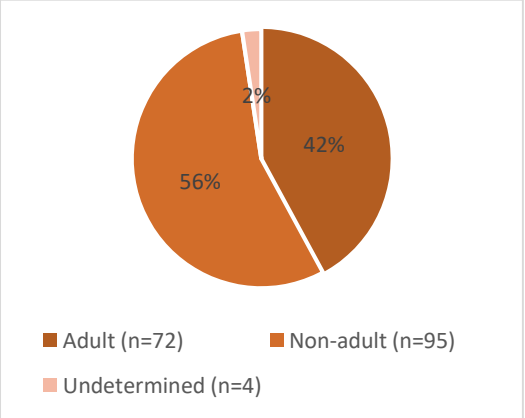


Figure 24. Distribution of age-at-death in the population of Den Haag Grote Kerk Cemetery (after Pavlović & van Veen, 2021, p. 188).

Contrary to what might be expected if there were a correlation between socioeconomic status and the location of the burials, the results of statistical analyses show that there is not a significant variation in the frequency of diseases between the various excavated parts of the cemetery around the Grote Kerk (Pavlović & van Veen, 2021, p. 211). However, overall health conditions in the form of multiple deficiency diseases and different types of trauma seem to suggest that the excavated individuals buried in the cemetery of Grote Kerk in Den Haag had a low socioeconomic background (Pavlović & van Veen, 2021, p. 212).

Figure 25. Map of The Netherlands with the highlighted location of Den Haag and Alkmaar (after Beerens, 2021, p. 5).

3.4 Materials: Belgium

3.4.1 Cemetery of St. Rombout Churchyard in Mechelen

The first studied site in Flanders is located in Mechelen, Belgium. The cemetery of the St. Rombout Churchyard was excavated from 2009 to 2011 (Depuydt et al., 2013, p. 9). After archaeological excavation, 3617 graves with the remains of 4158 individuals were found (Depuydt et al., 2013, p. 17). The cemetery had a rather long life span; the earliest remains from burials are dated to the 9th–11th centuries, and the latest is dated to the late 18th century (van de Vijver, 2017, p. 15). Thus, scholars separated all studied individuals into four groups according to their approximate chronology: for this thesis, the focus is on groups one and two, which consist of individuals from the 17th and 18th centuries, respectively (Depuydt et al., 2013, p. 119). These two groups included the remains of 1387 individuals (van de Vijver, 2017, p. 56).

Figure 26 demonstrates that the percentage of individuals identified as males (365 people, or 34 %) is higher than the percentage of individuals identified as females (245 people, or 23 %). Moreover, Figure 27 shows that the age group of adults is the biggest of all. Nonetheless, sex was estimated only for 1079 adult individuals (van de Vijver, 2017, p. 54).

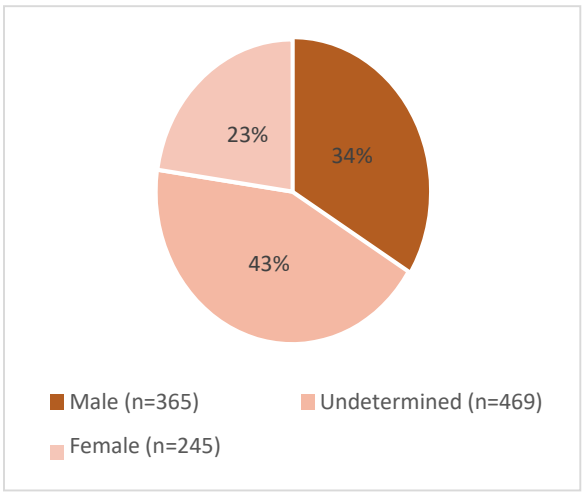


Figure 26. Distribution of sex in the population of St. Rombout Church (after van de Vijver, 2017, p. 56).

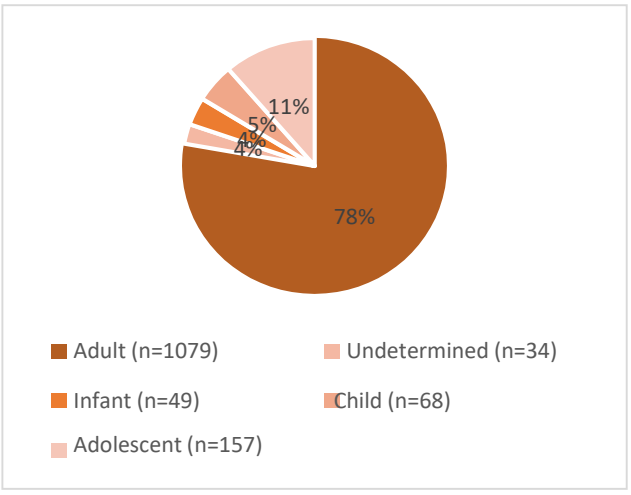


Figure 27. Distribution of age-at-death in the population of St. Rombout Church (after van de Vijver, 2017, p. 56).

Statistical investigations demonstrate that there is no significant change in the frequency of medical conditions across the different excavated parts of the cemetery around St. Rombout Church, which runs counter to what one would predict if there were a link between socioeconomic class and the location of the graves (van de Vijver, 2017, p. 27). Nevertheless, multiple deficiency diseases and the prevalence of poor oral hygiene indicate that the people whose graves were excavated in this cemetery likely came from middle or low socioeconomic groups (van de Vijver, 2017, p. 27).

3.4.2 Cemetery in the city center of Kruishoutem

The second studied Flemish site is located in East Flanders. In 2020, a big excavation was organized and carried out in the center of Kruishoutem (van Kampen et al., 2022, p. 9). After a sophisticated investigation, the remains of a former Sint Eligiuskerk that was demolished in the 19th century and a related parish cemetery were found (van Kampen et al., 2022, p. 15). In total, the remains of 1154 individuals were found (van Kampen et al., 2022, p. 65). Moreover, according to the archaeological analysis, the cemetery in Kruishoutem was in use for a long period of time; thus, all excavated remains were separated into four chronological groups (van Kampen et al., 2022, p. 66). For this research, the focus is only on group four because it consists of burials dated between the 17th century and the 18th century (van Kampen et al., 2022, p. 68). This group includes the remains of 664 individuals (van Kampen et al., 2022, p. 85).

Figure 28 shows that there are roughly as many males (204, or 42 %) as females (210, or 43 %) identified from group four from the cemetery of Kruishoutem. Moreover, Figure 29 demonstrates that adults make up the vast majority of this population, making up the biggest age group by quite a bit. Similar to the above-mentioned osteological analyses, sex was estimated for only 488 adult individuals (van Kampen et al., 2022, p. 90).

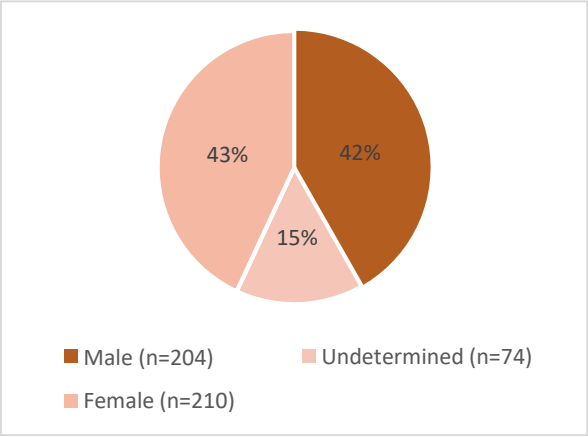


Figure 28. Distribution of sex in the population of Kruishoutem (after van Kampen et al., 2022, p. 90).

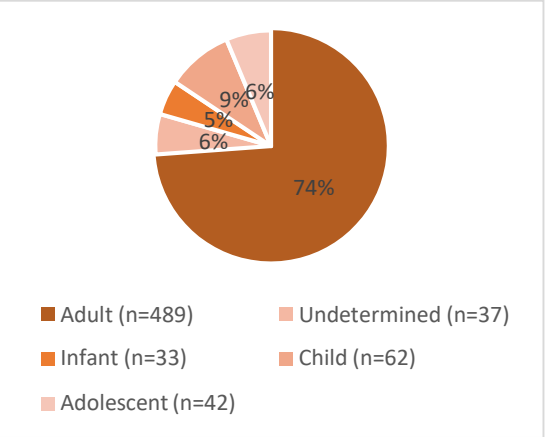


Figure 29. Distribution of age-at-death in the population of Kruishoutem (after van Kampen et al., 2022, p. 90).

Based on the findings of the archaeological investigations, it is reasonable to believe that individuals of both middle and low socioeconomic groups used this cemetery (van Kampen et al., 2022, p. 142). Due to the fact that there is minimal variance in the locations of graves and remains and the exceptions are limited in number, it is futile to use these data to determine socioeconomic patterns (van Kampen et al., 2022, p. 84). Therefore, the archaeological analysis of the burial finds was the main method applied for the estimation of the individual's status. more specifically. A low quantity of discovered beads, which were likely a component of a deceased individual's jewelry, and a small number of metal artifacts can potentially reflect the middle and low socioeconomic status of individuals buried in the cemetery of Kruishoutem (van Kampen et al., 2022, p. 141).

Figure 30. A map of Belgium which demonstrates the location of Mechelen and Kruishoutem (https://www.weather-forecast/Kruishoutem)

3.5 Materials: data selection

It is essential to highlight that not all individuals excavated and subsequently analysed by osteologists are used for this research. There are several factors that influence the calculation of the final number of analysed individuals. First of all, the most important factor is the preservation rate because, even though for the osteological analysis only skeletons with sufficient preservation are selected, this preservation does not always reflect the dental preservation, which can also be affected by multiple ante-mortem factors such as ante-mortem tooth loss and post-mortem factors like the acidity of the soil (White & Folkens, 2005, pp. 50–67). The second factor is age. The detailed osteological analysis is commonly conducted only for remains of adults due to their generally higher level of preservation and a higher possibility of accurate sex estimation determined by the fact that once an individual reaches maturity, the bones can reflect a sufficient differentiation of sexes (White & Folkens, 2005, p. 385). In addition, the main focus of this research is on dental pathology, whose prevalence is affected by tooth loss, including primary tooth loss. Thus, it is common to record pipe notches only for individuals with permanent teeth. Finally, for the research on the post-medieval pipe smoking habit, the focus has to be only on the remains of individuals buried after the introduction of tobacco to Europe; thus, for some long-used cemeteries, only burials from the 17th century onward are chosen for the study. Together, these factors reduced the total number of individuals studied and narrowed the research to analyzation of only the most representative human remains. Table 1 shows an overview of all studied sites and the number of individuals chosen for the study of the prevalence of pipe notches.

Table 1. An overview of all studied site including the number of individuals studied for the presence of pipe notches and the socioeconomic background of each site.

Site name	Number of excavated individuals	Number of individuals studied for this research	Presumed socioeconomic status
Cemetery of St. Martin church in Birmingham, England	857	302	Mix: high and low
Cemetery of St. Mary and St. Michael church in London, England	705	248	Low
Kilkenny Union Workhouse cemetery in Ireland	970	307	Mix: middle and low
Spike Island cemetery in Ireland	26	22	Low
Cemetery of the Grote Kerk in Alkmaar, The Netherlands	901	62	High
Cemetery of the Grote Kerk in Den Haag, The Netherlands	244	48	Low
Cemetery of St. Rombout churchyard in Mechelen, Belgium	4158	616	Mix: high and low
Cemetery in Kruishoutem, Belgium	1154	490	Mix: middle and low

3.6 Methods

All selected human remains were preliminary analyzed by osteologists. Among the main components of osteological analysis, you can usually find age-at-death and sex estimation, as well as a description of the pathological conditions. In this section, I describe the age-at-death and sex estimation methods. After that, the measuring systems that were applied by osteologists during their analysis of the excavated remains are described, followed by a discussion of their comparability. Then, I explain the conducted dental analysis and the method used for scoring pipe notches. Finally, I explain how the data is analyzed in the context of this thesis.

3.6.1 Estimation of age-at-death

There were many methods that were used at different sites for the estimation of age-at-death, and most of the time, multiple methods were combined to obtain the most accurate results. When the age at death of adult individuals was estimated, most osteologists focused on the degree of ossification of various parts of the skeleton. For the estimation of ossification of the pelvis, scoring was carried out for the auricular surface of the ilium bone according to Buckberry and Chamberlain (2002) and the symphysis of the pubic bone according to Brookes and Suchey (1990). The closure of the cranial sutures was conducted according to Meindl and Lovejoy (1985), and the structure of the sternal end of the ribs according to Iscan and Loth (1989) or Iscan, Loth, and Wright (1984). Nevertheless, it is crucial to notice that not all archaeological reports provide detailed information regarding the applied methods.

Furthermore, it is not possible to determine the exact age-at-death with the methods currently in use. Therefore, it is common to use age groups for age estimation. However, different scholars use different age groups in their reports: some osteologists follow the five-group system, such as the one used for the analysis of skeletons from St. Martin Churchyard in Birmingham, skeletons from St. Rombout Church in Mechelen, and skeletons from the cemetery in Kruishoutem. At the same time, other specialists used the system with only two or three age groups: a first group for adults or individuals 18 years old and older, a second group for non-adults or people who are younger than 18 years old; and, in some cases, such as for remains from Grote Kerk in Den Haag, an undetermined group if such individuals were used for the osteological analysis. Therefore, to increase the size of the research, I used a two-age-group system consisting of one group for adults and one for individuals with undetermined ages. For the statistics where it was required, I grouped all sub-groups for individuals older than 18 years old at the moment of death, such as young adults, middle adults, and old adults, into one group of adults.

3.6.2 Estimation of sex

When estimating sex, osteologists usually pay attention to the sex-specific morphological characteristics of certain parts of the skeleton, such as the skull and pelvis. In most of the studied cases, two methods for sex estimation were used, which were described in the guidelines made by Ferembach et al. (1980) and Buikstra and Ubelaker (1994). Still, the measuring systems varied between different reports. In some cases, such as for Grote Kerk's remains in Den Haag and remains from St. Martin Church in Birmingham, the five groups were used for the evaluation of the results: female, probably female, undetermined, probably male, and male. However, in all other archaeological reports, scholars used only three groups: male, female, and undetermined. Thus, to increase the research size, I use a three-sex-group system: female, male, and undetermined. For the cases where it was required, I grouped together the rates for probably males with males and probably females with females.

3.6.3 Estimation of socioeconomic status

Each site that was chosen for this research has its own unique combination of historical and archaeological background, which determined the applied methods for the estimation of the socioeconomic background of the studied individuals. In the cases where the historical sources provided sophisticated evidence for the attribution of a specific socioeconomic group that was buried in this particular cemetery, this information was used without additional archaeological investigation. However, there are a few cases where the cemeteries were used by representatives of more than one socioeconomic group. Therefore, additional criteria, in the form of archaeological research, were required for the estimation of the individuals' statuses. For each particular case, the applied methods were described above.

In addition, different specialists used different categories for the naming of the socioeconomic groups: there

were cases when the separation was made between low and high status, or low, middle, and high status. However, in most cases, it was not possible to distinguish between middle and low socioeconomic backgrounds. Therefore, to increase the size of the research, I used two categories for the description of socioeconomic status: high and low. In cases where the distinction was not established, the low socioeconomic group included representatives of the middle socioeconomic group.

3.6.4 Dental analysis and scoring pipe-notches

Another important part of the osteological analysis that was used for this research was the description of dental conditions. Similarly to the methods applied for age-at-death and sex estimation, not all scholars explicitly describe the applied methods. However, most of them followed the two-digit method of Keiser-Nielsen (1971). As a result, information about the number of excavated teeth, the number of permanent teeth as well as the frequency of post-mortem and ante-mortem tooth loss was mentioned (White & Folkens, 2005, pp. 127-130). In addition, pathological anomalies, such as tooth decay caused by caries, calculus, abscesses, enamel hypoplasia, and periodontitis, were also reported (White & Folkens, 2005, pp. 127-130). However, the primary focus of this research was on the statistics of the presence of pipe notches. Due to the fact that not all studies provided the exact number of identified pipe notches, it was decided to score pipe notches per individual and not per tooth: the presence of a pipe notch would be recorded for an individual if more than two teeth from this individual showed the presence of a semi-circular cavity.

3.6.5 Data analysis

For my research, an Excel spreadsheet has been filled with all of the collected data for each site. Tables are used to record the information that was gathered on the individuals' estimated sex, age, and pipe notch prevalence for each site. Estimates of both sex and age are derived from data that is already available. According to the information from the publications and reports included in the pathologies sections, the presence of pipe notches among people has been incorporated into the research. The sites are categorized into several categories according to their socioeconomic standing as well as their geographical location. The statistical tests are used to determine the prevalence of pipe aspects across the various age groups and sexes throughout the various regions and locations. Due to the significant difference in the scale of the studied collections, it was decided to compare not the absolute rate, or the number of individuals with pipe notches, but the relative index, or the percentage of individuals with pipe notches among each sample.

Chapter 4. Results

This chapter presents the results of the research. Firstly, the prevalence of pipe notches is described in the context of the demographic statistics of each site. Then, the results of the comparison of the prevalence and demographic patterns first between sites from one region and then between regions are presented. The chapter concludes with an overview of the most striking distinctions and commonalities within and across the studied groups.

4.1 The prevalence of pipe notches among individuals from Great Britain

Overall, according to the osteological analysis of the excavated individuals from the cemetery of St. Martin Church in Birmingham, 11 individuals out of 302 adults have pipe notches (Brickley et al., 2006, p. 145). This corresponds to 3.64 % of the population. Moreover, all 11 individuals with pipe notches are identified as males, which gives us a 100 % male smoker rate for the Birmingham site (Brickley et al., 2006, p. 145). Table 2 shows that the estimated age of individuals with pipe notches is also rather homogenous: 10 individuals (90.9 %) are identified as adults, and one male individual (9.1 %) is added to the undetermined age group (Brickley et al., 2006, p. 145).

Table 2. The prevalence of pipe notches among the population of St. Martin Cemetery in Birmingham (n=11;A=10; UA=1).

Sex/Age	Adult	Undetermined age
Male	90.9 %	9.1 %
Undetermined sex	0 %	0 %
Female	0 %	0 %

As it was mentioned before, individuals from low and high socioeconomic backgrounds were buried in the cemetery of St. Martin. Therefore, the burial context has to be used for the estimation of the status of the studied individuals. According to the provided description of the burial contexts for the individuals with pipe notches from the Birmingham St. Martin cemetery, it can be suggested that 10 male individuals, including one person of undetermined age, belong to the working class because they were excavated from simple earth-cut graves, whereas one adult male individual was excavated from a vault burial, which can indicate the high socioeconomic status of the person (Brickley et al., 2006, p. 145). However, according to the authors of the report, there is a possibility that a mistake was made during the documentation; thus, they suggest that it is highly probable that this adult male individual was found inside an earth-cut burial (Brickley et al., 2006, p. 145). Therefore, we can conclude that it is most likely that 100 % of the pipe notches were recorded among individuals with low socioeconomic status.

In the population from St. Mary and St. Michael cemetery in London, the overall prevalence of pipe notches

is 23.4 % because, among 248 individuals selected for this research, 58 have pipe notches (Walker & Henderson, 2010, p. 213). As can be seen from Table 3, three, or 5.2 % out of these 58 individuals are estimated to be females, and 55, or 94.8 %, are estimated to be males (Walker & Henderson, 2010, p. 213). In regards to the age groups, all individuals with pipe notches are identified as adults (Walker & Henderson, 2010, p. 213). The socioeconomic status of all individuals buried in the cemetery of St. Maria and St. Michael in London is estimated to be low according to the historical and archaeological background of the site (Walker & Henderson, 2010, p. 213).

Table 3. The prevalence of pipe notches among the population of St. Maria and St. Michael Cemetery in London n=58; M=55; F=3).

Sex/Age	Adult	Undetermined age
Male	94.8 %	0 %
Undetermined sex	0 %	0 %
Female	5.2 %	0 %

Let us compare the prevalence of pipe notches among two populations at the studied British sites. As can be seen in Figure 31, the prevalence of pipe notches is almost five times higher for the population of London than for the population of Birmingham.

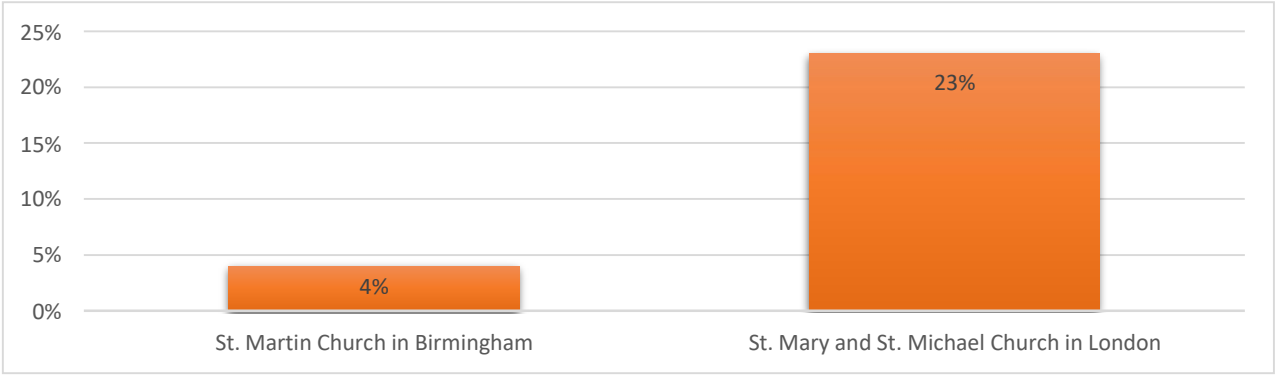


Figure 31. The prevalence of pipe notches in Birmingham and London (n=11; n=58 respectively).

However, Figure 32 demonstrates that the demographic and socioeconomic trends of both sites are considerably similar. There are predominantly adult individuals with pipe notches in the cemetery of Birmingham and only adult individuals with pipe notches in the cemetery of London. Moreover, only male smokers have been recorded for Birmingham cemetery, and most smokers from the cemetery in London are estimated to be male (94.8 %). Nonetheless, there are records of female smokers found in the context of the London cemetery used by people with low socioeconomic backgrounds. Still, another similarity is that in both cases, pipe notches are recorded among individuals with low socioeconomic status.

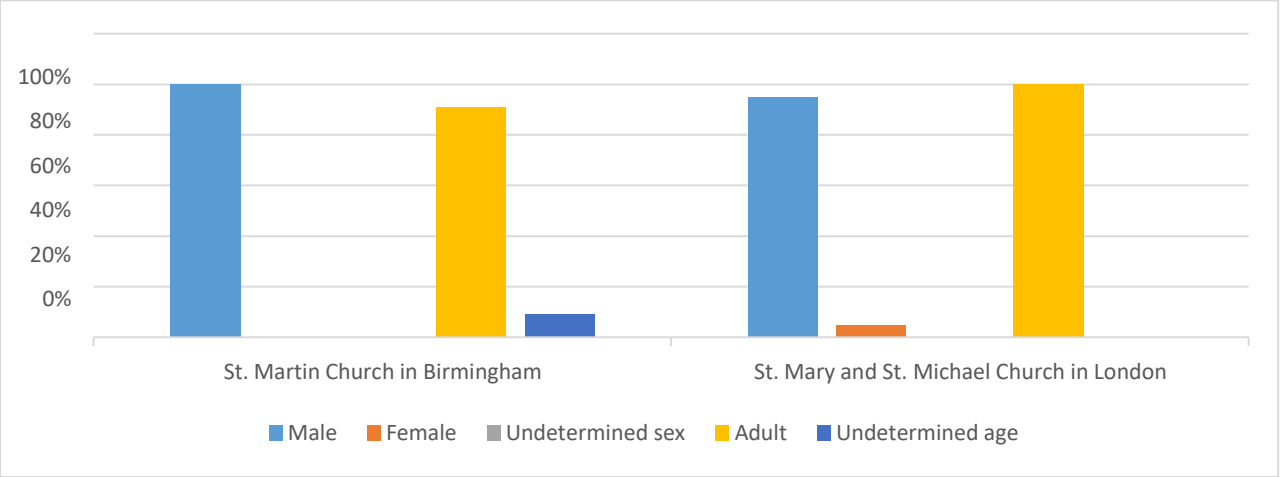


Figure 32. The demographic patterns in the prevalence of pipe notches in Birmingham and London (n=11; M=11; A=10; UA=1; n=58; M=55; F=3; A=58 respectively).

4.2 The prevalence of pipe notches among individuals from Ireland

The estimated prevalence of pipe notches among selected individuals from Kilkenny Union Workhouse Cemetery in Ireland is 46.3 % because this feature is recorded among 142 individuals out of 307 (Geber & O'Donnabhain, 2020, p. 180). As can be seen in Table 4, among these 142 individuals with pipe notches, 101, or 71.1 %, are identified as males, whereas 41, or 28.9 %, are identified as females (Geber & O'Donnabhain, 2020, p. 180). The socioeconomic status of the individuals with pipe notches is assumed to be primarily low according to the comparatively high prevalence of dental diseases, which are associated with low socioeconomic backgrounds (Hobdell et al., 2003; Yamamoto-Kuramoto et al., 2023).

Table 4. The prevalence of pipe notches among the population of Kilkenny Union Workhouse Cemetery (n=142; M=101; F=41).

Sex/Age	Adult	Undetermined age
Male	71.1 %	0 %
Undetermined sex	0 %	0 %
Female	28.9 %	0 %

For the cemetery of Spike Island, the presence of pipe notches is recorded for 17 people out of 22 studied (Geber & O'Donnabhain, 2020, p. 180). This is equivalent to 77.3 %. Moreover, according to the osteological report, all of these individuals are identified as males, and they are all identified as adults (Geber & O'Donnabhain, 2020, p. 180). The above-described burial context of the cemetery determines the estimation of the low socioeconomic background of these individuals.

Figure 33 shows the prevalence of pipe notches among these two Irish sites. There is a considerable difference between the two rates, with the one for Spike Island Cemetery being higher than the one recorded for the cemetery of Kilkenny Union Workhouse.

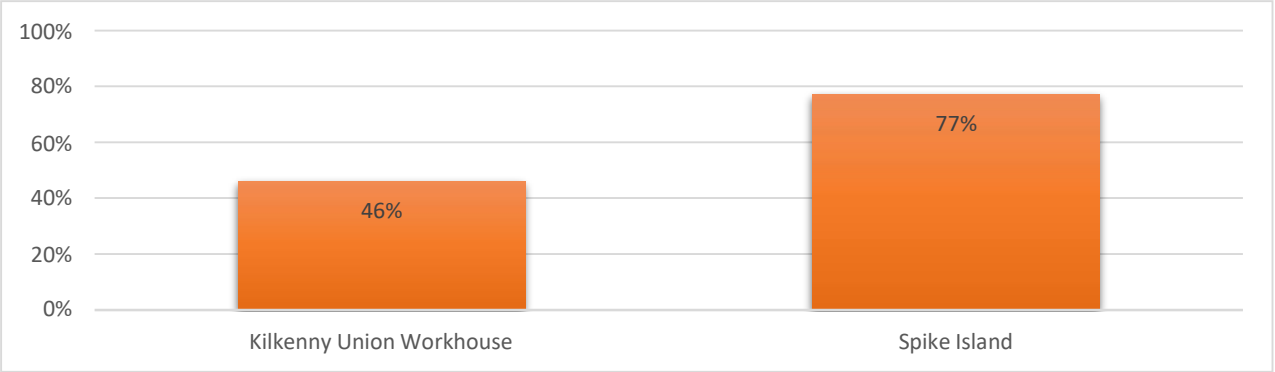


Figure 33. The prevalence of pipe notches in Kilkenny and Spike Island (n=142; n=17 respectively).

The age group patterns at both sites are similar because all individuals with pipe notches are identified as adults. However, the rest of the demographic trends are distinct. In contrast to Spike Island, where all individuals are identified as male, in Kilkenny Union Workhouse, there are also female individuals with pipe notches. Nonetheless, the socioeconomic background of individuals with pipe notches from these two sites does not vary because all individuals have a low socioeconomic status.

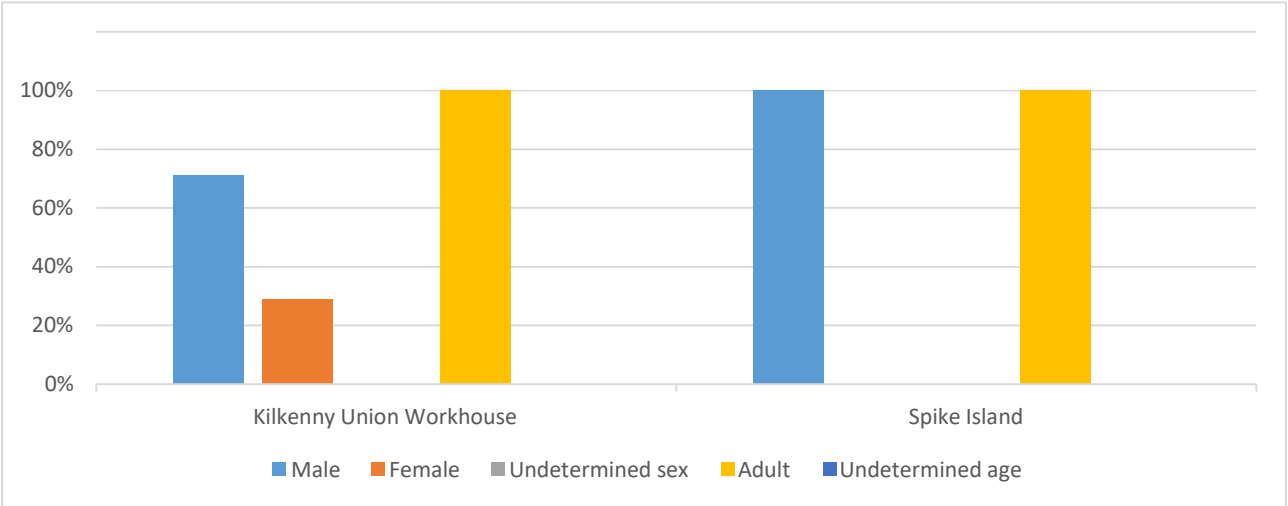


Figure 34. The demographic patterns in the prevalence of pipe notches in Kilkenny Union Workhouse and Spike Island (n=142; M=101; F=42; A=142; n=17; M=17; A=17 respectively).

4.3 The prevalence of pipe notches among individuals from The Netherlands

Overall, out of the 198 studied individuals from the cemetery of Alkmaar Grote Kerk, 37, or 19 % have pipe notches (Baetsen & Bitter, 2001, p. 74). Table 5 demonstrates that among the individuals with pipe notches, 31, or 83.8 %, are estimated to be males, while the sex of 6 individuals, or 16.2 % of all studied cases, is undetermined (Baetsen & Bitter, 2001, p. 74). All 37 individuals with pipe notches from Alkmaar cemetery are estimated to be adults (Baetsen & Bitter, 2001, p. 74). With regards to the socioeconomic background of these 37 individuals, according to the location of the burials and the low level of diseases associated with the

lifestyle of individuals with low status, it can be concluded that these people had high status.

Table 5. The prevalence of pipe notches among the population of Alkmaar cemetery (n=37; M=31; US=6).

Sex/Age	Adult	Undetermined age
Male	83.8 %	0 %
Undetermined sex	16.2 %	0 %
Female	0 %	0 %

The prevalence of pipe notches among analyzed individuals from the cemetery located next to Den Haag Grote Kerk is 4.2 % because only two individuals out of 48 have pipe notches (Pavlović & van Veen, 2021, p. 191). Moreover, the sex of both individuals is estimated to be male, and the age group that is assigned to them is adults (Pavlović & van Veen, 2021, p. 191). The socioeconomic background of these individuals is estimated to be low, according to the high prevalence of deficiency diseases and traumas associated with low socioeconomic strata.

As can be seen in Figure 35, the prevalence of pipe notches among the studied Dutch sites is substantially distinct, with the Alkmaar index being more than four times higher than the index from Den Haag cemetery.

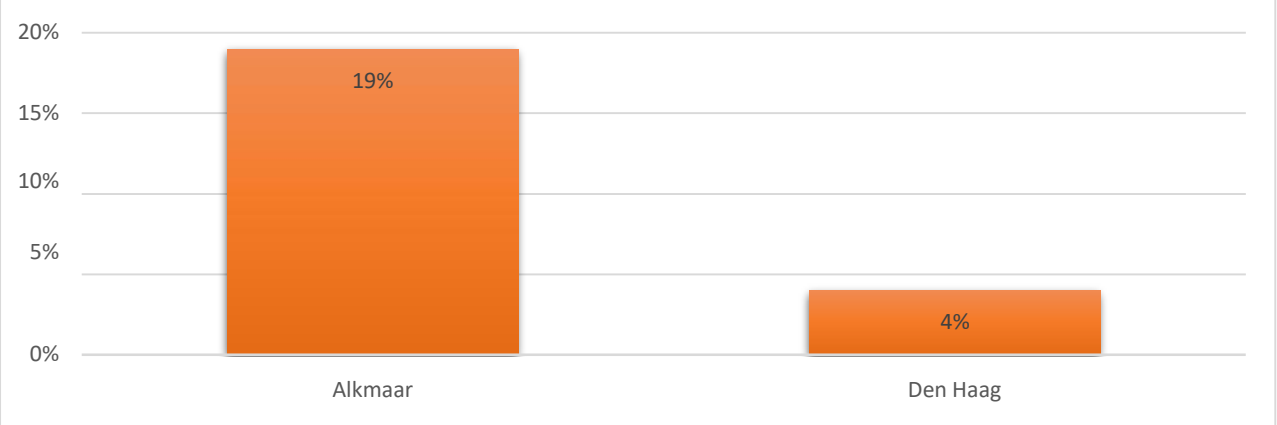


Figure 35. The prevalence of pipe notches in Alkmaar and Den Haag (n=37; n=2 respectively).

According to Figure 36, some demographic patterns in the prevalence of pipe notches among two Dutch sites overlap. At both sites, all individuals with pipe notches were identified as adults. Although there were individuals with undetermined sex from Alkmaar cemetery, most of the individuals with pipe notches were males, whereas all individuals from Den Haag cemetery were males.

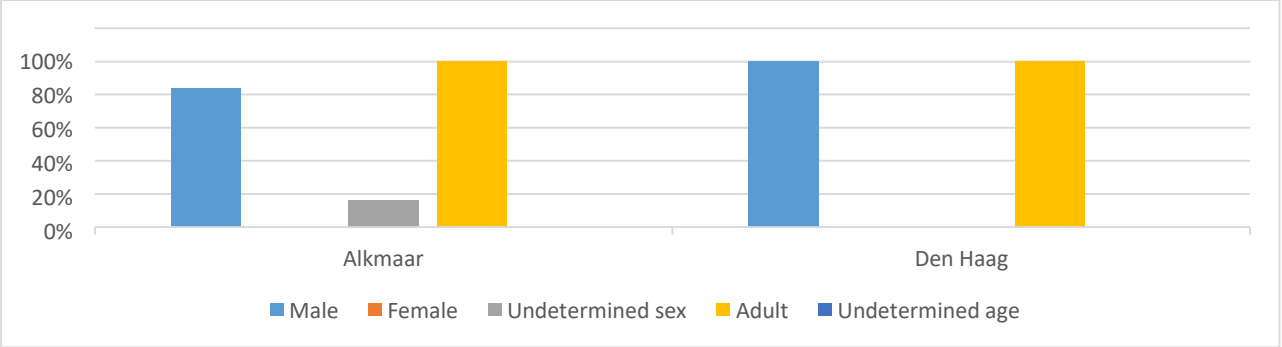


Figure 36. The demographic patterns in the prevalence of pipe notches in Alkmaar and Den Haag cemeteries (n=37; M=31; US=6; A=37; n=2; M=2; A=2 respectively).

4.4 The prevalence of pipe notches among individuals from Belgium

The prevalence of pipe notches among studied individuals from St. Rombouts Cemetery in Mechelen is 0.3 % because only two people out of 616 have characteristic semi-circular wear on the teeth (Depuydt et al., 2013, p. 193). Moreover, the results of the sex estimation show that both individuals are males, and the age estimation results put these two individuals in the age group of adults (Depuydt et al., 2013, p. 193). According to the high level of dental diseases and overall poor dental hygiene recorded for the individuals with pipe notches, it can be suggested that these two individuals are both representatives of the low socioeconomic strata of Mechelen.

The presence of pipe notches is recorded among 29 out of 490 studied individuals from the cemetery in Kruishoutem (van Kampen et al., 2022, p. 99). The appendix demonstrates a detailed description of these cases. However, it is crucial to mention that the remains of one individual for whom this specific wear is documented are dated before the 16th century (van Kampen et al., 2022, p. 100). According to the authors of the report, it is highly possible that, in this particular case, the dental wear was caused not by continuous pipe smoking but by another use of teeth (van Kampen et al., 2022, p. 100). Therefore, it can be concluded that 28 individuals out of 490 analyzed skeletons from Kruishoutem have pipe notches, which is equal to 5.7 %. Table 6 shows that for one individual out of these 28, the sex is undetermined, whereas the sex of 27 individuals is estimated to be male (van Kampen et al., 2022, p. 99). Furthermore, all these individuals are put into one age group of adults (van Kampen et al., 2022, p. 99). In regard to the socioeconomic status of these individuals, it can be suggested that they are all representatives of the middle or low classes, according to the lack of elaborate burial goods found inside their burials (van Kampen et al., 2022, p. 100).

Table 6. The prevalence of pipe notches among the population of Kruishoutem cemetery (n=29; M=28; US=1).

Sex/Age	Adult	Undetermined age
Male	96.4 %	0 %
Undetermined sex	3.6 %	0 %
Female	0 %	0 %

The comparison of the prevalence of pipe notches between these two Belgian sites is visible in Figure 37. The rate for Mechelen cemetery is significantly smaller than the rate for Kruishoutem.

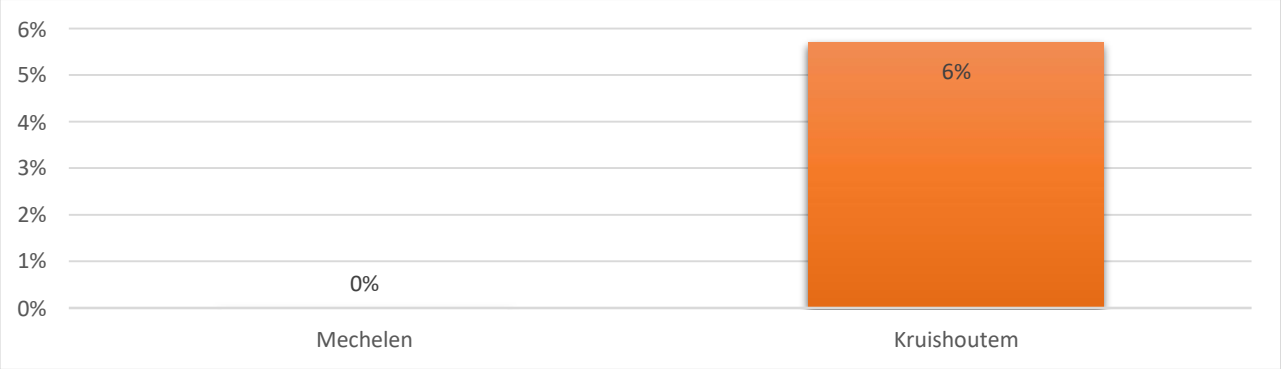


Figure 37. The prevalence of pipe notches in Mechelen and Kruishoutem (n=2; n=28 respectively).

However, the demographic patterns differentiate less between Mechelen and Kruishoutem because in both cases, all individuals with pipe notches are identified as adults. Nevertheless, in contrast to Mechelen, where the sex of all individuals is estimated to be male, in Kruishoutem there was one individual with an undetermined sex.

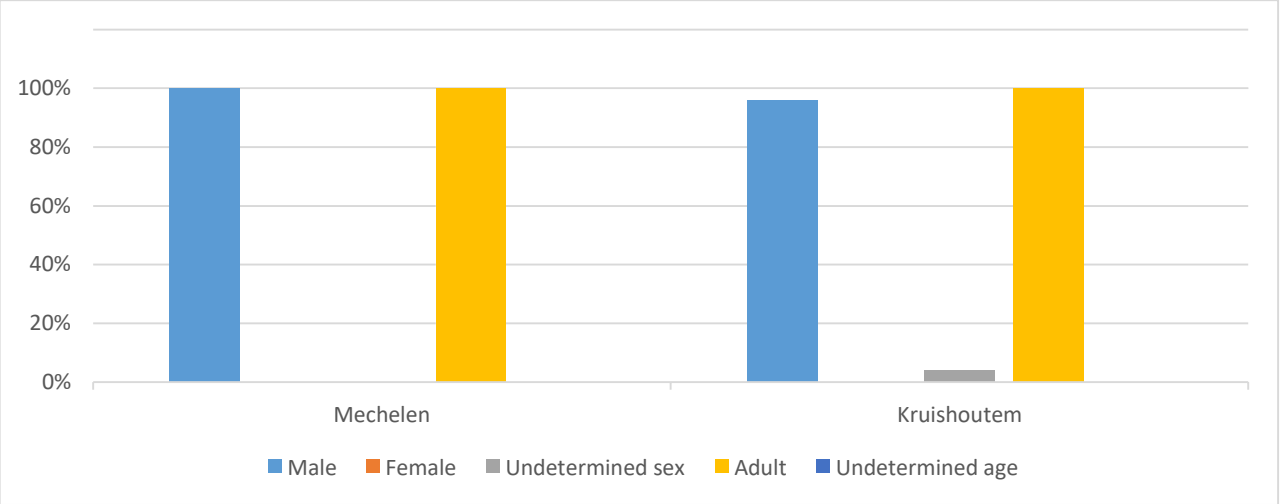


Figure 38. The demographic patterns in the prevalence of pipe notches in Mechelen and Kruishoutem cemeteries (n=2; M=2; A=2; n=28; M=27; US=1; A=28 respectively).

4.5 Inter-regional comparison

As can be seen through the following figures and tables, the prevalence of pipe notches varies substantially among studied sites in different regions. Figure 39 demonstrates that, out of all the studied regions, both sites with the highest prevalence of pipe notches are in Ireland: Kilkenny Workhouse Cemetery and Spike Island. The third-highest prevalence of pipe notches is recorded at the London site. This rate is twice lower than the rate from Kilkenny. The rate of Dutch Alkmaar follows London's prevalence, and there is not much of a

difference between the two rates. A considerably lower rate is recorded for the Flemish site of Kruishoutem, the Dutch site in Den Haag, and the British site in Birmingham. These three rates are not significantly different from each other, but they are almost three times lower than the rate from Alkmaar. The lowest rate was recorded in the Flemish site of Mechelen, and this prevalence is dramatically lower than any other.

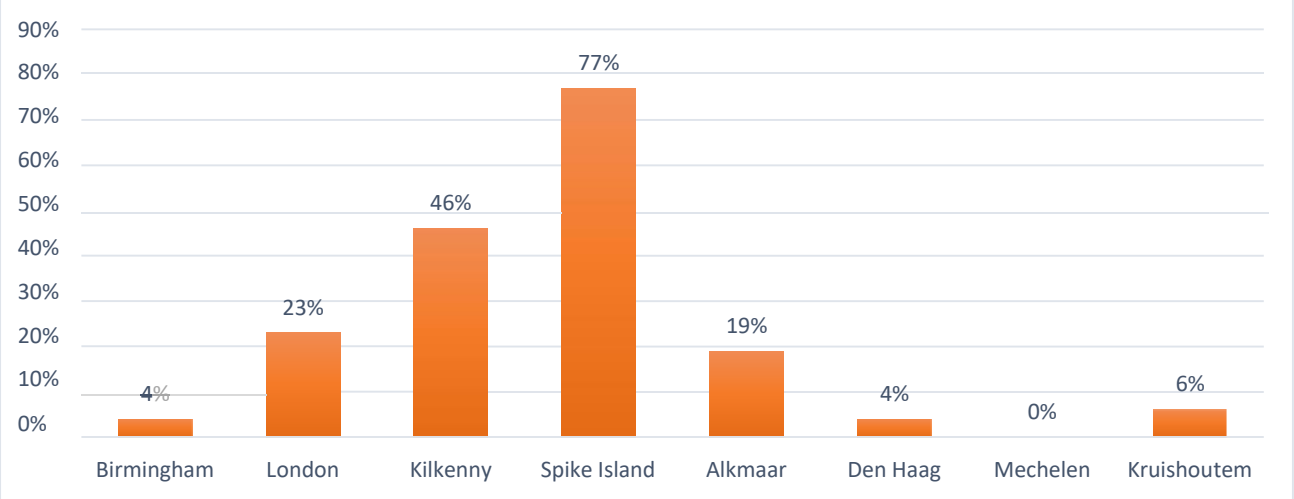


Figure 39. The prevalence of pipe notches among the analysed individuals from all chosen sites.

With regards to the sex patterns in the prevalence of pipe notches, Figure 40 demonstrates that in most of the sites, including Birmingham, Spike Island, Den Haag, and Mechelen, pipe notches are recorded exclusively among males. This statistic forms a clear trend in the prevalence of pipe notches. However, there are two studied sites, in London and Kilkenny, where pipe notches are recorded among female individuals. The highest rate of pipe notches among females is recorded at the Kilkenny site, whereas the prevalence of this feature in London is almost six times lower. Moreover, there are two sites, Alkmaar and Kruishoutem, where pipe notches are identified among individuals with undetermined sex.

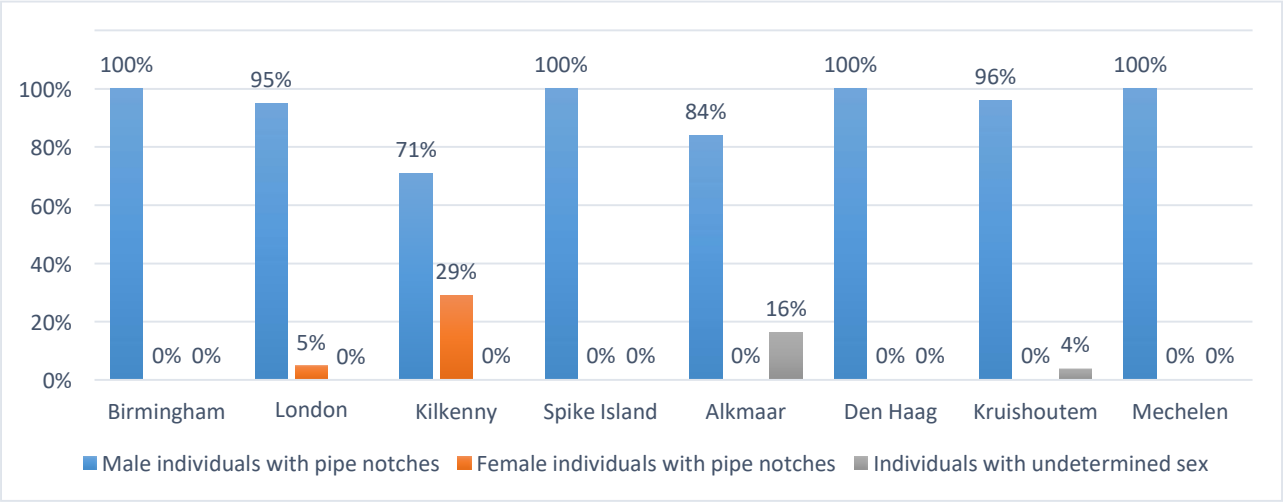


Figure 40. The prevalence of pipe notches among male and female individuals, as well as individuals with undetermined sex, from all studied sites.

Figure 41 shows that almost in all studied sites from all chosen regions, individuals with pipe notches are identified as adults. The only exception is the British site in Birmingham, where one individual with pipe notches has an undetermined age.

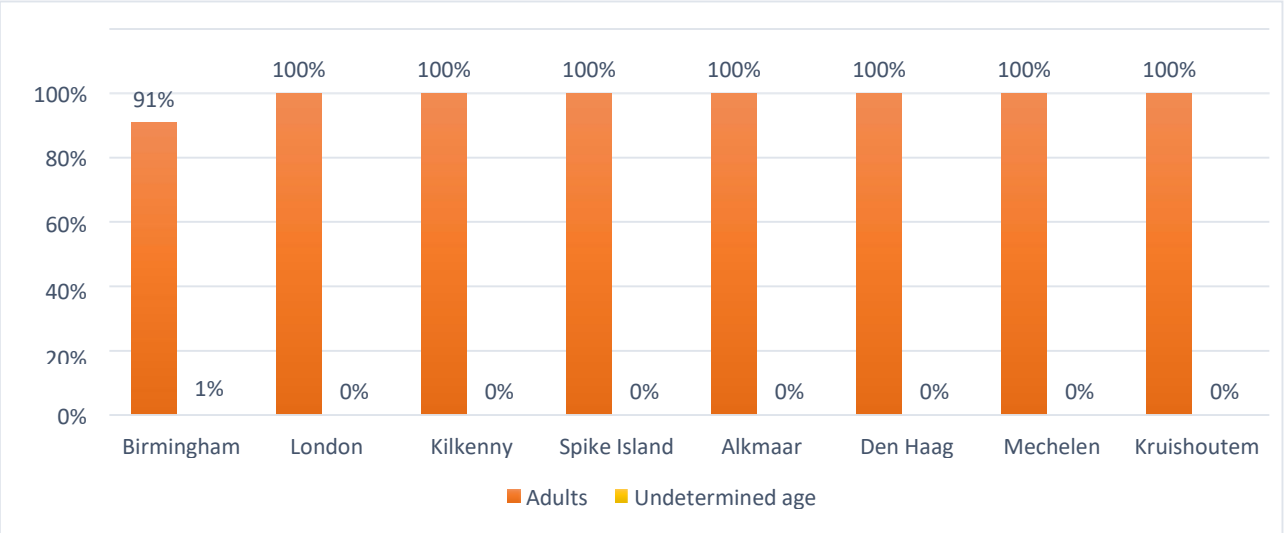


Figure 41. The prevalence of pipe notches among adults and individuals with undetermined age from all studied sites.

The socioeconomic pattern is visible in Figure 42. Taking into consideration all studied individuals from all chosen sites, pipe notches appear to be mainly associated with individuals from low socioeconomic groups. Moreover, at all cemeteries where individuals from different socioeconomic backgrounds were buried, such as Birmingham, Kilkenny, Den Haag, Mechelen, and Krishoutem, all individuals with pipe notches are identified being related to the low socioeconomic strata. The only population in which representatives of high socioeconomic status have a comparatively high prevalence of pipe notches is the one found at the cemetery in Alkmaar.

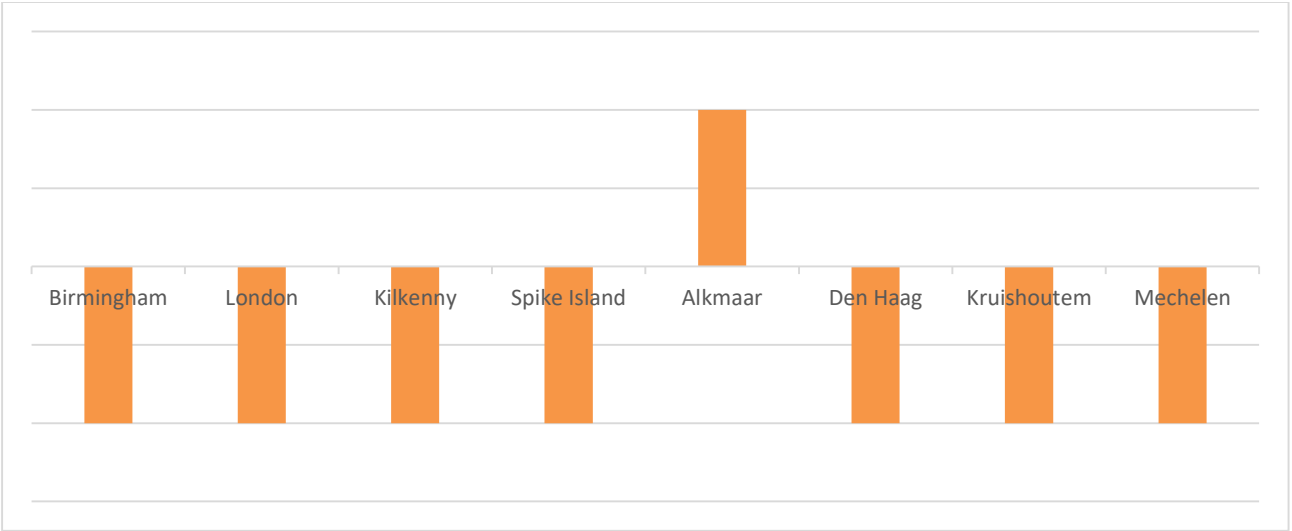


Figure 42. Socioeconomic status of individuals with pipe notches from all studied sites. The upper bar of Alkmaar represents the high socioeconomic status of individuals with pipe notches, whereas the lower bars of the rest of the sites represent the low socioeconomic status.

Overall, when the frequency of pipe notches is compared between all studied sites, we can notice that males have a higher prevalence of pipe notches than females in all eight populations. In a similar manner, the comparison of the prevalence among people of undetermined age and adults indicates that in all eight cases, the corresponding percentage of adults is more significant. The results of the comparison of the prevalence of pipe notches among individuals with different socioeconomic status from one site also highlight a clear trend of a significantly higher rate of pipe notches recorded among people with low status. Moreover, the results of the comparison of the prevalence of pipe notches between all studied sites from all chosen regions demonstrate that the prevalence of this feature reflects a certain pattern, with the highest rates seen within a particular cultural group and among one specific sex, age, and status group. However, there are also recorded divisions from the main trend.

Chapter 5. Discussion

In this chapter, the results described in the previous chapter are discussed. The chapter starts with a number of general remarks on the interpretation of the presented data and the discussion of the relation between the estimated prevalence and the historical circumstances in which it was recorded. Moreover, the similar and opposite trends observed at sites from the regions not selected for the research are described. Finally, the limitations of the collected data and the applied methods that might influence the results are also discussed in this chapter.

5.1 Prevalence of pipe notches in the studied regions

According to the research results, Irish sites have the highest prevalence of pipe notches among all studied regions, indicating that tobacco pipe smoking was a common practice among the post-medieval population of Ireland. This rate makes perfect sense given the cultural traditions that have developed in Ireland. According to different historical and anthropological sources used by Danaher (1962) for his book, there were many recorded cases when different foreign travelers would make explicit notes regarding the widely accepted practice of pipe smoking in Ireland and conclude that it was an old local tradition. Furthermore, an explanation for this can be found in Walsh's theory (2001, p. 21), in which the growing tobacco consumption and substantial assimilation of the pipe smoking tradition in Ireland during the 17th century were associated with the growing patriotism and development of national ideas. This potentially explains the results of research carried out by Hartnett (2004), which also get in line with the idea of Geber and O'Donnabhain (2020) mentioned above. According to Hartnett (2004, p. 140), the pipe smoking tradition was especially widespread due to the additional meaning of resistance against colonial domination assigned to this practice. Hartnett used the study of pipes excavated from different sites in Galway as a case study for understanding the explicitly political and rebellious nature of the pipe smoking tradition developed in this city. According to this study, not only the pipe smoking but also the pipes with the incised and painted decoration of Irish national symbols and slogans were part of this manifestation (Hartnett, 2004, pp. 140–144).

Furthermore, the third highest rate of all studied sites and the highest rate recorded among any sites outside Ireland are also associated with the Irish individuals who migrated to London and were buried at the cemetery of St. Mary and St. Michael Church. The considerable difference between the two studied sites in Great Britain proves that the prevalence of pipe notches and the associated pipe smoking tradition fundamentally depend on the national and cultural circumstances, which in the case of St. Mary and St. Michael Cemetery were determined by the continuation of the cultural traditions brought by people from Ireland to Great Britain. Moreover, the broader context of the prevalence of pipe notches recorded in multiple cemeteries in London provides further support for this explanation. In three post-medieval cemeteries in London, Bow Baptist Church, St. Marylebone Church, and Cross Bones Cemetery, the recorded prevalence of pipe notches is considerably lower than the 23.4 % prevalence estimated for St. Mary and St. Michael Church: less than 3 %,

less than 1 %, and less than 7 %, respectively (Brickley et al., 1999, p. 77; Henderson et al., 2013, p. 40; Miles et al., 2008, p. 36). Thus, it can be concluded that pipe smoking was more popular among post-medieval Irish individuals than British. Furthermore, this osteologically estimated low prevalence from British sites can also be explained in the context of the imperialistic relationships between Great Britain and Ireland, where the citizens of the former were often associated with the poorest socioeconomic classes. Thus, the pipe-smoking behavior so well developed in Ireland could obtain a rather negative connotation in the eyes of the British population (Hilton, 2000, p. 48).

The prevalence of pipe notches recorded at two sites in the Netherlands is lower than what might be expected from a region with a well-developed tobacco market and a well-developed visual art associated with pipe smoking. However, although all selected and studied sites are dated to the post-medieval period, the difference between their life spans was sometimes more than 100 years. Therefore, for Grote Kerk Cemetery in Den Haag, the low level of pipe notches presence can be explained by the historical conditions of the cemetery, which was closed in 1681, not long after smoking popularization in the Netherlands (Pavlović & van Veen, 2021, p. 192). Thus, the tradition of pipe smoking was probably not as common during the 17th century in Den Haag as it was during the following centuries. In addition, an explanation for the prevalence of pipe notches among individuals from Alkmaar cemetery is the recorded high rate of ante-mortem tooth loss, which was caused by poor dental hygiene and the expected luxurious diet of the representatives of high socioeconomic strata (Baetsen & Bitter, 2001, p. 74). Thus, I suggest that many teeth could not be investigated, and the actual proportion is likely more significant.

The lowest rate of pipe notches is recorded at both Flemish sites selected for this research. In the context of historical and economic circumstances, these rates are significantly lower than what might be anticipated from the region directly involved in the international tobacco trade and production of pipes (Blondé & van Damme, 2015, p. 227). However, the recorded rates can be explained by the limitations of the research. Firstly, not that many studies have been carried out about the history of tobacco consumption in Flanders. The art-history sources do not provide a lot of additional information either. Hence, the background data regarding the historical and cultural specificities of pipe smoking in Flanders might not be sufficient to be able to make an accurate prediction. Furthermore, the prevalence of pipe notches could be substantially affected by the poor preservation conditions of teeth. As with any other osteological investigation, we should not ignore the taphonomic influence on the preservation of dental remains. In the case of pipe notches, the line between normal variation due to environmental factors and pathological disorders is especially blurred (Meyer et al., 2011, p. 205). This could make the identification of pipe notches, among other types of dental wear, extremely difficult (Depuydt et al., 2013, p. 193).

5.2 Demographic patterns in the prevalence of pipe notches

Regarding the male-female patterns in the prevalence of pipe notches, a widespread pattern can be assigned to

three regions: Great Britain, Belgium, and the Netherlands. There, almost all individuals with pipe notches were identified as males. Although there are a few females with pipe notches being recorded for one British site, they probably belong to the commune of Irish immigrants. Thus, the osteologically estimated male-female pattern provides further support for the theory that pipe smoking during the post-medieval period in these North-Western European regions was associated with masculine identity and had a rather negative connotation for women (Brongers & Spill, 1964, p. 45; Hilton, 2000, p. 48). The art historian data also overlaps with the osteologically estimated male-female pattern for Great Britain. Moreover, the broader archeological context of Flemish post-medieval sites provides further support for this trend. For instance, according to osteological research on human remains from a cemetery of Haar Kerk, located in the Flemish village of Oosterweel, all pipe notches were identified exclusively among males (van Cant, 2013, p. 23). Therefore, what we can assume, according to the low number of found paintings with pipe-smoking women and the significantly low prevalence of pipe notches recorded from Flemish sites for males and zero cases of pipe notches found among females, is that pipe smoking was a rather uncommon practice during the post-medieval period in this region, especially among women.

The situation with historically and osteologically estimated demographic patterns in the Netherlands is different. Although, according to Dushenko (2014, p. 165), there are many examples of Dutch post-medieval paintings with female smokers, a sex-based disparity in the prevalence of pipe notches between male and female dentitions can be understood as a general trend with the scale of the entire Dutch community because there are more post-medieval Dutch sites with a high prevalence of pipe notches among male individuals. For instance, according to Veselka and Klomp (2019, p. 150), in a cemetery of Andreaskerk in Hattem, pipe notches were recorded among 60 % of all studied males, whereas based on the work of Inskip et al. (2023, p. 8), in a Broerenkerk Cemetery in Zwolle, 48 % of all males were smokers, and in Beemster, 97 % of all studied male individuals had pipe notches. Therefore, it can be concluded that the low prevalence of excavated female individuals with the recorded presence of pipe notches indicates that post-medieval Dutch paintings with smoking women demonstrated a rather rare occasion and probably had predominantly moralizing aims.

Nevertheless, remarkably different statistics were recorded for Ireland, where, although a higher prevalence is recorded for male smokers, the prevalence of pipe notches among the female population is considerably higher than in any other studied region. Therefore, similar to the claim made by Bielenberg and Johnson (1998, p. 1), pipe smoking was a developed tradition among Irish males and females. This once again indicates the cultural specificities of Ireland and the special relationship of the post-medieval Irish with pipe smoking.

Furthermore, according to the carried-out research, almost all studied individuals with pipe notches from all regions belong to the age category of adults. Nevertheless, although the age estimation of collected individuals with sophisticated levels of preservation is a paramount component of any physical anthropological investigation, it is common for dental analyses, especially those related to the pipe smoking habit, to focus only on adult individuals. Therefore, even in the reports and articles in which specific age groups are

mentioned, such as the one for the London site shown in Figure 43, the prevalence of pipe notches is described only for the age groups of adults, and no information is provided for non-adults. It might be suggested that it is a drawback because our modern perception of the pipe-smoking habit and related social rules does not necessarily reflect the realities of the traditions and rules around the pipe-smoking habit in the past.

	No. teeth	Pipe notches	%
18–25 yrs	600	22	3.7
26–35 yrs	1,148	106	9.2
36–45 yrs	1,089	103	9.5
46+ yrs	218	29	13.3
Total	3,055	260	8.5

Figure 43. The prevalence of pipe notches among adult male individuals from the cemetery in London (after Walker & Henderson, 2010, p. 213).

5.3 Socioeconomic patterns in the prevalence of pipe notches

In addition to the cultural and demographic impact on the prevalence of pipe notches, the habit of tobacco smoking was also influenced by another culturally defined variable - social status. According to the results, the prevalence of the pipe smoking habit is considerably higher among the representatives of low socioeconomic groups from the three studied regions: Great Britain, Ireland, and Belgium. Even at the sites where mixed socioeconomic groups were buried, such as in Kruishoutem, Mechelen, Kilkenny, and Birmingham, the pipe notches were recorded only among individuals with low status. Moreover, if we take a look at other sites from the studied regions, this pattern becomes more evident. For instance, based on the report written by Molleson (1993), among all studied individuals excavated from a cemetery of Christ Church in London that was used exclusively by wealthy people, zero pipe notches were recorded. This pattern is similar to the one formed based on historical data provided in the work of Goodman (2005) about the European history of tobacco and the claims of Walker and Henderson (2010, p. 216) about the negative perception of tobacco consumption among wealthy British citizens. In addition, a substantially higher prevalence of pipe notches among the individuals from the cemeteries used exclusively by poor people, such as the ones on Spike Island and in London, only further supports this claim.

Still, it is essential to note that the statistics are different for the Netherlands, where the highest prevalence, with almost half of all males having pipe notches, is recorded at the cemetery in Alkmaar, used exclusively by wealthy citizens. It is interesting to identify that the results from the osteological analysis actually support some of the historical dynamics identified through the Dutch paintings: although people with low socioeconomic status started the habit of pip smoking, with time, this habit also found its way to higher levels

of social stratification (Borodina, 2022, p. 60). Moreover, this rate provides further support for the historically-based claim of a widespread practice of pipe smoking in the Netherlands, especially increased due to the belief that tobacco could protect against the plague, which was one of the main fears during the 17th century (Hughes, 2003, p. 124). Interestingly, this belief was also recorded in the British "Journal of a Plague Year," published in London after the Great Plague (Withington, 2020, p. 1754). Despite some fictional elements, this historical source is considered to be a valid source of first-hand information regarding the thoughts about the plagues of the people who lived during the 17th century (Bastian, 1965, p. 172). Thus, it is particularly intriguing that contrary to the belief in the protective nature of tobacco among wealthy British citizens, tobacco smoking, estimated according to the prevalence of pipe notches recorded from the studied sites, is low among high socioeconomic strata. A possible explanation for this can be the fact that both British sites are dated to the 18th and 19th centuries. According to the results of historical research carried out by Ravenholt (1990), during the 18th century, snuffing became more common among the higher classes of Europe, but pipe smoking remained the preferred method of tobacco consumption among the working class.

Chapter 6. Conclusion

The aim of this research has been the estimation of the demographic and socioeconomic patterns in pipe smoking habits during the post-medieval period in four chosen regions of North-Western Europe: Great Britain, Ireland, the Netherlands, and Belgium. This has been done by the comparison of the prevalence of the most reliable osteological evidence of continuous practice of pipe smoking—pipe notches. For this research, the populations from eight cemeteries from post-medieval North-Western Europe have been studied: St. Martin Church in Birmingham, St. Mary and St. Michael Church in London, Kilkenny Union Workhouse, Spike Island, Grote Kerk in Alkmaar, Grote Kerk in Den Haag, St. Rombout Churchyard in Mechelen, and the former Sint Eligiuskerk in Kruishoutem. The goal has been to find the answer to the main research question:

What demographic and socioeconomic patterns can be observed in the tobacco pipe smoking habit in Great Britain, Ireland, and the Low Countries, and how do they compare?

It is necessary to begin by formulating the responses to the sub-questions in order to be in a position to provide a comprehensive response to the main question. Following the conclusion, a few recommendations for future studies are discussed.

6.1 Answers to the sub-questions

This section starts with an answer to the first sub-question:

What is pipe notch prevalence in individuals from Great Britain, Ireland, and the Low Countries, and what differences can be observed?

The prevalence of pipe notches varies substantially between sites in the same region and between sites in different study areas. The highest pipe prevalence is recorded for the Irish sites of Spike Island and Kilkenny, and it is equivalent to 77 % and 46 %, respectively. The prevalence of pipe notches recorded for Great Britain and the Netherlands is comparatively similar between the two countries but substantially lower than the Irish and higher than the Belgian. In Great Britain, the prevalence of pipe notches recorded in Birmingham is 4 %, and in London, it is 23 %. Among Dutch sites, the higher prevalence is estimated in Alkmaar – 19 %, whereas in Den Haag, it is 4 %. A significantly lower rate is estimated for both Belgian sites: in Kruishoutem, the prevalence is 6 %, and in Mechelen, the prevalence is 0.3 %.

Moving on to the answer to the second sub-question:

What demographical trends in terms of sex and age groups in pipe prevalence can be observed in individuals from Great Britain, Ireland, and the Low Countries, and what differences can be observed?

The intra-population comparisons demonstrate that during the post-medieval period, tobacco pipes were smoked mostly by male individuals in three out of the four studied regions. In one out of two studied sites from these three regions – Den Haag in the Netherlands, Mechelen in Belgium, and Birmingham in Great Britain – the pipe notches are present only among male individuals. However, a deviation from this major trend is recorded in Flemish Kruishoutem and Dutch Alkmaar, where some individuals with pipe notches have undetermined sex. A more significant divergence of male-female patterns is recorded among the Irish communities. The highest prevalence of pipe notches among females (29 %), recorded from the Irish Kilkenny cemetery, is followed by the rate from the London cemetery (5 %), used exclusively by Irish immigrants. In regards to the age trend, it can be concluded that the majority of the individuals with pipe notches died after reaching maturity. The only recorded exception is the individual of undetermined age recorded in Birmingham. Nonetheless, more sophisticated research is needed.

Finally, let us answer the third sub-question:

Are there any differences in the presence of pipe notches between individuals with different socioeconomic statuses?

There is a considerable difference in the prevalence of pipe notches between populations with representatives of various socioeconomic groups. In Great Britain, Ireland, and Belgium, all individuals with pipe notches are identified as representatives of the low socioeconomic strata of their communities. Nevertheless, a deviation from this main trend is recorded in the Netherlands, where the highest prevalence of pipe notches is recorded among individuals with high socioeconomic status.

6.2 Answering the main research question

In conclusion to this research, it might be suggested that the evidence of osteologically estimated routine behaviors, such as the prevalence of pipe notches left after regular practice of pipe smoking, may shed crucial light on bygone societies. According to the results of the research, the pipe-smoking habit had variable manifestations in different social, economic, and cultural conditions. As such, there was one primary trend in the prevalence of pipe notches: most of the studied remains with pipe notches from all four regions belonged to adult male individuals with low socioeconomic status. However, there were exceptions to this trend recorded in different ethnic groups. As such, during the post-medieval period, pipe smoking was also common among Irish females, and in the Netherlands, there were more smoking individuals with high status than low status. Furthermore, according to the results, the popularity of pipe smoking also varied among different nations. Therefore, it can be concluded that the manner and frequency of tobacco smoking appear to be primarily determined by the social, economic, and cultural conditions of the societies in which these people lived. This can reflect the circumstances when, despite the historically recorded interconnection of North-Western European societies, local variations still existed.

6.3 Recommendations for future research

Nevertheless, post-medieval pipe smoking research has numerous open issues and potential future lines of inquiry. There are two main directions in which I would like to recommend the development of subsequent research: a broader geo-cultural investigation and a more specific age-related study. The former idea is self-explanatory: It might be scientifically valuable to carry out research covering a broader region. I might suggest focusing the research on Scandinavian and South European countries in relation to the regions studied in this thesis because, historically, they have been economically and culturally related (Majewski & Gaimster, 2009, p. 529). Moreover, it might be useful to take into account a currently ongoing project: Tobacco, Health, and History (https://www.tobaccohealthhistory.co.uk/). This study investigates the prevalence of illness in three Western European nations—England, the Netherlands, and Spain—before and after the introduction of tobacco and puts these trends in historical perspective. The prominent direction of this research is related to the influence of smoking on health. An especially interesting question that is currently being studied is the development of a metabolomics-based technique for identifying tobacco exposure (Tobacco, Health, and History, n.d.). While macroscopically identifying regular pipe smokers is possible and widely used, for instance, for this thesis, the identification of occasional smokers is currently complicated. However, this new method might provide an opportunity to obtain a more accurate representation of tobacco consumption statistics.

The latter topic related to the more detailed study of the age of smokers is potentially intriguing because there have been some small-scale attempts to identify more specific age patterns of pipe smoking, which resulted in an estimated trend of Irish female individuals starting the regular smoking habit earlier than male individuals (Geber & Murphy, 2018, p. 10). However, this research would require more detailed osteological data. Hence, I would recommend using first-hand information for this since most of the reports and articles used in this thesis lack a detailed description of the age and sex groups assigned to individuals with pipe notches. A prominent source of first-hand information can be the online archaeological archive of the Museum of London (https://www.museumoflondon.org.uk/collections/access-and-enquiries/archaeological-archive), which has a detailed description of excavated remains from multiple post-medieval British sites. Unfortunately, research access is currently unavailable due to the reorganization of the museum storage, but it is planned to make it open again in 2024.

Abstract

The aim of this thesis is to study the prevalence of tobacco pipe smoking habits among individuals from post-medieval North-Western European societies. This was researched by comparing the prevalence of pipe notches among the post-medieval populations of Great Britain, Ireland, the Netherlands, and Belgium. The results of the osteological analysis of human remains excavated from eight cemeteries are used: for Great Britain, the cemetery used by a low-status population of London buried in the cemetery of St. Mary and St. Michael Church, and the cemetery used by the high and low socioeconomic status population in Birmingham; for Ireland, a cemetery of Kilkenny Union Workhouse used by people from middle and low socioeconomic groups and cemetery on Spike Island used for people from low socioeconomic strata; for the Netherlands, the cemetery of the Grote Kerk in Alkmaar used by citizens with high socioeconomic status and cemetery of the Grote Kerk in Den Haag used by low socioeconomic status citizens; for Belgium, the cemetery of St. Rombout Churchyard in Mechelen used by people with high and low socioeconomic backgrounds and the cemetery in Kruishoutem used by representatives of middle and low socioeconomic groups.

The collection of representatives of different socioeconomic groups from various cultural communities is compared to each other for the estimation of the cultural, demographic, and socioeconomic trends in the habit of tobacco pipe smoking in post-medieval North-Western Europe. These populations were divided into two age groups and three sex groups for the statistical analysis.

The results demonstrate that pipe smoking was most common among low-status male individuals from three North-Western European regions: Great Britain, Ireland, and Belgium. In the Netherlands, a high prevalence of pipe notches is recorded among adult male representatives of high socioeconomic strata. Moreover, a significantly higher prevalence of pipe notches and, thus, the expected regular practice of pipe smoking is recorded in post-medieval Ireland. The estimated rates from Great Britain and the Netherlands are lower but also substantially higher than the prevalence recorded for post-medieval Belgium. These differences can be explained by the historical and cultural specificities of the regions. Therefore, these results further support the theory that social, economic, and cultural factors had a major influence on the Cross-European spread and subsequent integration of the tobacco pipe smoking tradition into North-Western European countries.

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Appendix

Appendix 1. Information on all individuals with pipe notches who were included in the research of Kruishoutem in Belgium (after Rebergen, n.d.).

Individunummer	FASE	DAT_FASE	Leeftijdsinterval	Pijprokersslijtage	Geslacht
169	4	1630-1850	36-49 (MA)	Ja	M
181			26-35 (LYA)	Ja	M
183	4	1630-1850	36-49 (MA)	Ja	M
187	4	1630-1850	18-25 (EYA)	Ja	M
192	4	1630-1850	36-49 (MA)	Ja	M
193	4	1630-1850	50-59 (OA)	Ja	M
194	4	1630-1850	50-59 (OA)	Ja	M
196	4	1630-1850	50-59 (OA)	Ja	M
201	4	1630-1850	26-35 (LYA)	Ja	M
202	4	1630-1850	26-35 (LYA)	Ja	M
206	4	1630-1850	26-35 (LYA)	Ja	M
226	4	1630-1850	18-25 (EYA)	Ja	M
333	4	1630-1850	18-25 (EYA)	Ja	M
347	4	1630-1850	60+ (SEN)	Ja	M
358	4	1630-1850	50-59 (OA)	Ja	M
376	4	1630-1850	36-49 (MA)	Ja	M
398	4	1630-1850	26-35 (LYA)	Ja	M
413	4	1630-1850	26-35 (LYA)	Ja	M
435	4	1630-1850	50-59 (OA)	Ja	PM
440	4	1630-1850	36-49 (MA)	Ja	M
445	4	1630-1850	26-35 (LYA)	Ja	M
455	4	1630-1850	36-49 (MA)	Ja	PM
541	4	1630-1850	36-49 (MA)	Ja	PM
574	4	1630-1850	60+ (SEN)	Ja	PM
613			36-49 (MA)	Ja	PM
606	4	1630-1850	50-59 (OA)	Ja	M
615	4	1630-1850	18+ (Adult)	Ja	IND
720	2	1250-1450	18+ (Adult)	Ja	PM
730	4	1630-1850	26-35 (LYA)	Ja	M