

The Medieval Transylvanian Oral Condition: A Case Study in Interpretation and Standardization

Katie Zejdlik^{1*}, Jonathan D. Bethard², Zsolt Nyárádi³, and Andre Gonciar⁴

¹ Anthropology and Sociology Department, Western Carolina University

² Department of Anthropology, University of South Florida

³ Haáz Rezső Museum, Odorheiu Secuiesc, Romania

⁴ ArchaeoTek-Canada LLC., Ontario, Canada

Keywords: medieval; dental; health; Székely; Transylvania; archaeology

ABSTRACT Interpretation of dental ‘health’ in archaeologically derived skeletal assemblages is challenging due to the lack of patient histories, clearly understood pathological processes, broad etiologies, and cultural perceptions of health. Furthermore, the language used in description of pathological conditions of the oral cavity condition is not consistent across researchers thereby resulting in challenging cross-site comparison. Standardization of terms and description is necessary as proposed by Pilloud and Fancher (2018). This paper demonstrates the challenges associated with cross-site comparisons through an attempt to place medieval Transylvanian Székely peoples’ oral condition within a larger medieval cultural and biological framework. To do this, first, a review of medieval perceptions of dental health and treatment is provided. Next, a total of 90 individuals recovered from two medieval Székely cemeteries were analyzed for pathological conditions of the oral cavity. The results of the analysis were then compared to other medieval skeletal assemblages reporting on dental ‘health’. Results show that conditions of the medieval oral cavity cannot be generalized and comparisons are further complicated by a lack of standardization in description and reporting thus supporting this volume’s call for standardization. Results also show that conditions of the oral cavity are specific to time and place even between the two Transylvania sites discussed.

Health, as a descriptive term, is commonly used in the bioarchaeological literature to indicate evidence of pathological modification on the skeleton. However, the World Health Organization includes mental and social factors, in addition to bodily disease states, as important to an assessment of health (WHO, 1999). Reitsema and McIlvaine (2014) have added that a majority of pathological modifications observable in skeletal and dental tissues could have been caused by a myriad of conditions. Within the more focused parameters of oral health, the lack of patient histories, clinical records, and environmental living conditions has resulted in inconsistent application of terminology, understanding of disease etiologies, and recording of observations in bioarchaeological contexts (Pilloud & Fancher 2019, this volume). What this means is that to understand the ‘health’ of a population, one must consider physical, mental, and social factors without access to patient histories, clearly understood etiologies, or standardized definitions among researchers. Bioarchaeologists are suited to address this challenge through the application of a multi-

faceted approach that pieces together cultural and biological information. Combined with the use of standardized language, communication between researchers can be improved and interpretations more accurately compared across sites. This paper examines pathological conditions of the oral cavity among medieval Transylvanian Székely communities as a case study to apply the vocabulary and definitions discussed by Pilloud and Fancher (2019) and to demonstrate the challenges of comparison between sites. Furthermore, it contributes to the paucity of information available on archaeologically derived skeletal collections from Eastern Europe.

*Correspondence to:
Katie Zejdlik
Western Carolina University
Cullowhee, NC 28723
kzejdlik@wcu.edu

Condition of the oral cavity: Medieval cultural perspective

Human skeletal remains hold important information about the social and biological context in which a specific person navigated. Interpretation of that individual's lived experience begins with understanding the cultural context of the time. For the medieval individuals discussed here, an understanding of medieval medical practices is useful.

Healthcare in the middle ages was predominantly influenced by Hippocrates's 5th century B.C. humoral theory. In his treatise, *The Nature of Man*, Hippocrates stated that the body was composed of humours, or body fluids, specifically, blood, yellow and black bile, and phlegm. These humours corresponded with different conditions and seasons: blood, hot and wet, predominates in spring; yellow bile, hot and dry, in summer; black bile, cold and dry, in autumn; and phlegm, cold and wet, in winter (Jouanna, 2012). It was thought that every person had a different make-up of humours; even organ systems within people had different humoral constructions and poor health resulted when the humours were out of balance. The noted Greek physician, Galen, later supported and expanded Hippocrates' work, which gave it the sustainable success that carried it into the Enlightenment (Jouanna, 2012; King, 2013). Multiple other interpretations branched off Hippocrates' original idea but the vocabulary and general understanding of the humours remained prevalent in medieval understandings of health and medicine (Jouanna, 2012; King, 2013).

The broadly applied humoral theory extended into dentistry (Anderson, 2004; Bifulco et al., 2016). The Medical School of Salerno, Italy was one of the most influential medical resources of the medieval period. In addition to general medicine, they paid attention to dentistry and domestic oral hygiene. Trotula De Ruggiero, a person of somewhat mythic status associated with the Salerno school, is credited with writing the first treatise on oral hygiene (Bifulco et al., 2016). She advocated deep dental cleaning and brushing, mouthwash, chewing of herbs for daily cleaning and pleasant breath, as well as remedies for gingivitis, halitosis, and tooth whitening. Many of the ingredients she suggested are still used today in cosmetic and hygiene products (Bifulco et al., 2016). Though these practices are largely unobservable in skeletal remains, they indicate that medieval people were interested in oral care in addition to more visible and serious modifications.

Conditions of the oral cavity observable in the

archaeological record include general tooth decay, dental caries, periapical lesions, and tooth loss. Toothache, which could have several etiologies, the most treated problem in medieval dental medicine, was managed with everything from fumigations to oaths (Anderson, 2004; Bifulco et al. 2016). J. Platearius, a doctor in the Salerno school, wrote that dental pain was specifically a result of imbalanced warm and cold humours from the brain or stomach (cited in Bifulco et al., 2016). Additionally, some of the doctors at Salerno believed tooth decay was caused by odontalgic worms that caused pain with their movements, an idea that dates to Sumerian texts from 5,000 B.C. Gilbertus Anglicus (c. AD 1240) also agreed that tooth worms caused dental pain and required balancing the humours (cited in Anderson, 2004). Dental caries and fistulae were treated with herbal concoctions placed as a paste within the cavity of the tooth (Anderson, 2004) or by cauterizing the rotten dental pulp and sealing it with wax, which essentially destroyed the pulp chamber nerve supply (Bifulco et al., 2016).

Dental care was limited to non-invasive treatment (Anderson, 2004). Dental extraction was rarely cited in the Salerno documents because it was not a practice of physicians but rather "charlatans who practiced their profession in the streets and in open-air markets, and replacing the tooth with a tiny piece of wood or an iron bolt" (Bifulco et al., 2016:2). The 'charlatans' were barber surgeons and willing to do surgery, unlike doctors. They often learned their skill through performing surgery on the war wounded or as an apprentice; though, many had no formal education, and most were illiterate. Eventually surgery became a formalized profession and barbers were not allowed to provide surgical intervention except in cases of tooth extraction and blood-letting (Pelling, 1998). Access to barber surgeons was regulated by the Catholic Church and not accessible to females (Lopez et al., 2012). Those who could not access or afford a barber surgeon depended on prayer or pilgrimage as a means for a cure (Anderson, 2004). Medieval peoples understood that small infections of any type could become fatal if not attended to and took all available treatment precautions (Pelling, 1998).

In terms of actual oral health, it is unknown what medieval peoples perceived as unhealthy. Literature related to oral 'health' during the medieval period is often derived from skeletal assemblages and the interpretations of modern researchers. That is the problem with the casual use of the word 'health'. It is temporally and socially compli-

cated to define. At best, researchers must anecdotally pull information from various types of knowing (images, educational documents, song, and folklore) to try to understand an ancient perspective. In the case of the medieval oral condition, dental medicine and hygiene made important advancements during the medieval period and from that, we argue, that we can infer that the numerous treatments for dental pain and dental hygiene resulted from medieval concern for oral care.

Condition of the oral cavity: Medieval bioarchaeological perspective

Information derived from research on skeletal assemblages provides a data-driven perspective to complement the less direct information available from cultural sources like the examples discussed above. The bioarchaeological literature often reports on types and frequencies of dental modifications with reference to the social factors that might have impacted the results. These findings are then used to make an assessment about the dental, or overall, 'health' of the population represented by the skeletal assemblage. For instance, Lopez and colleagues (2012) reviewed the diverse factors that contribute to various conditions of the oral cavity covering explanations from clinical processes, gendered access to dental care, consumption of cariogenic foodstuffs, and culture-specific food preparation techniques. They demonstrated through a comprehensive literature review that generalizations about etiologies cannot be made and that the interpretations must be heavily context dependent. Lopez et al. (2012) investigated sex-differences in oral health from two medieval sites in Spain and concluded that there were no sex-based differences in dental health. These findings mirror similar contexts in France (Esclassan et al., 2009) and Croatia (Šlaus et al., 2011). However Lopez et al. (2012) note that when compared to the modern age individuals (late 18th century), sex-based differences were evident.

Belecastro and colleagues (2007) investigated diet changes and health decline in response to large social and economic changes after the fall of the Roman Empire. The dentition of two temporally contiguous sites (Roman Imperial to Early Medieval) in central Italy were investigated to make inferences about dietary practices across time. They concluded that overall protein consumption reduced after the decline of the Roman Empire and that the medieval diet consisting of higher carbohydrate intake led to an increase in dental wear, periapical lesions, and calculus. The lack of in-

creased dental caries was thought to be due to the increased level of wear resulting from a harder and more fibrous diet, which required longer and stronger mastication. As the complicated morphology of the tooth wore away, there would be less opportunity for carious lesions to form; an interpretation supported by dental data from other medieval sites (Caglar et al. 2007; Chazel et al. 2005; Esclassan et al. 2009). Belecastro and colleagues (2007) also coupled dental data with pathological skeletal markers and evidence of infectious disease to conclude that while diet did not appear to change in significant ways, health conditions present during the Roman Imperial era continued and then worsened.

The inverse relationship of high dental wear and low dental carious lesions was not found at other medieval sites investigating changes in dental data between medieval sites and other time periods (e.g. Šlaus et al., 2011; Srejić, 2001), which demonstrates the variability in the medieval oral condition. Another example is demonstrated through frequency of carious lesions. Low levels of carious lesions and dental wear were reported for a medieval coastal site in Croatia (Novak et al., 2012). Rapid urbanization of the site during the Late Medieval period led to an increase in infectious disease indicators and overall reduction of health (Novak et al., 2012). Conversely, high levels of carious lesions and dental wear were present in two medieval, cemeteries from Serbia (Srejić, 2001). The cause of the high frequency was interpreted to be a result of food processing and poor oral hygiene.

Overall, there does not appear to be a general status of oral condition across the medieval period and conditions are highly specific to geographic, temporal, and social contexts. Interpretations of 'health' range from multiple lines of evidence as discussed above to more limited interpretations about diet and comparison to other medieval sites (e.g. Caglar et al., 2007; Chazel et al., 2005; Srejić, 2001). Each author managed challenges associated with limited historical data, limited comparative sites, and a general lack of standardized recording and reporting methods. These were some of the hurdles faced when placing the Transylvania case study sites into various comparative categories.

Biocultural Context

For the last seven years, our work has focused on documenting the lives of medieval and early modern Transylvanian Hungarians (Bethard et al., 2019; Molnár, 2001). The study area encompasses a

region of Eastern Transylvanian located inside the Carpathian Basin. It is currently home to over 600,000 people and called the Székelyföld by the ethnic Hungarian inhabitants who have lived there for nearly 1,000 years.

In this study, two historically Hungarian Transylvanian cemeteries located 18.5km apart in Harghita County, Romania were analyzed (Figure 1). The Papdomb archaeological site in Văleni (Hungarian: Patakfalva), Romania designates the ruins of a medieval church and its associated burial grounds. The second archaeological site is a medieval cemetery located on the grounds of the Catholic Church in Bradеști (Hungarian: Fenyéd), Romania. Though inhabitants of both villages are identified as Romanian citizens today, the whole of Transylvania was not incorporated into the current political boundary of Romania until the conclusion of World War I. For the last millennium, the inhabitants of both Văleni and Bradеști have identified as Hungarian, more specifically, as Székely. For clarity of discussion, the sites will be referred to via their official archaeological site designators; Papdomb and Fenyéd.

Excavation of the Patakfalva cemetery site began in 2014 as a salvage project per the request of the villagers. A collaboration between the inhabitants of Patakfalva, the Haáz Rezső Múzeum in nearby Odorheiu Secuiesc, and ArchaeoTek-Canada, LLC was created to excavate and analyze the remains. The Papdomb site was used repeatedly for several hundred years as indicated by historic records, temporally specific artifacts like coins,

and evidence of burials truncated by later burials (Figure 2). In general, people were interred in a supine, extended position with their heads to the west, feet to the east. Body arrangement, soil stains left by decomposition, and remnants of coffin wood suggest that most individuals were buried in a coffin or a shroud. Overall preservation of skeletal remains, including infants, was good.

The Fenyéd cemetery was used repeatedly for several hundred years, primarily during the 11th and 12th centuries. Salvage excavations were conducted in 2013 due to erosion that exposed the medieval cemetery and a total of 54 burials were removed (Figure 3) (Nyárádi, 2013).

Historical information about the medieval period in Transylvania can be hard to find. Much of the research about the area is not published in English and does not show up in a standard literature search. Additionally, the history of the area is highly contentious in terms of which peoples invaded, owned, and occupied the landscape, as such sources can be heavily biased toward a singular perspective with conflicting information between sides (Lendvai, 2004). Archaeological evidence has been used as a more reliable indicator of the area's history (Țiplic 2006). However, even this method is complicated due to outside influences directing the interpretation of sites as a part of a pre-1990 Romanian research agenda (Cosma & Gudea, 2002 cited in Țiplic, 2006).

Archaeological and historical evidence demonstrates that starting in the 9th century the Carpathian Basin was an area of extensive biological and

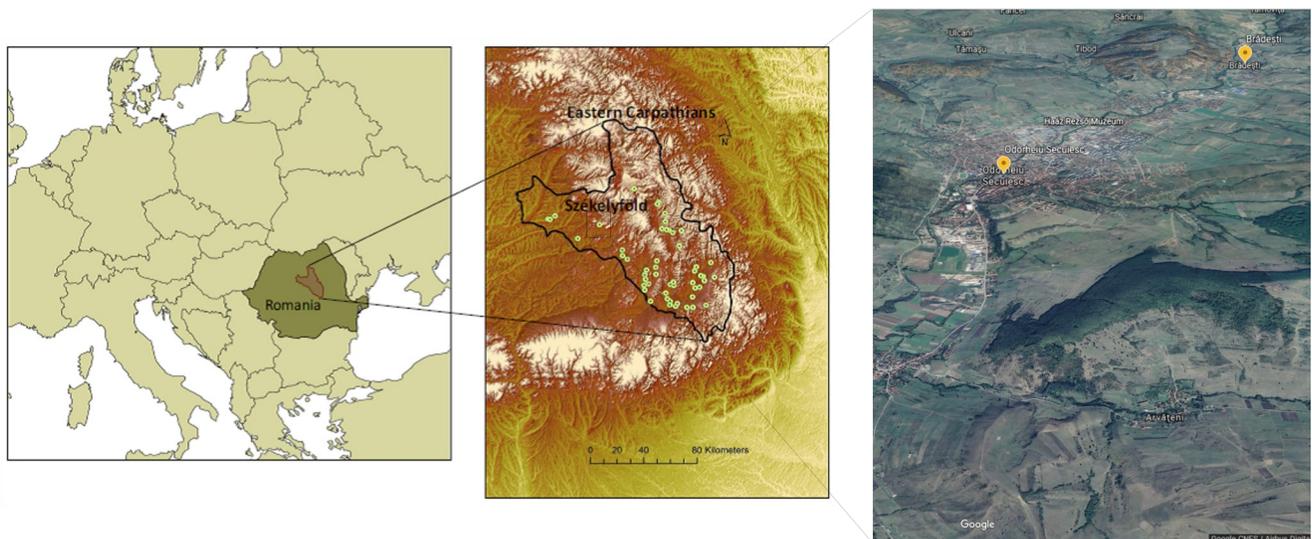


Figure 1. Tri-part map successively focusing on the location of the two cemeteries. Map modified from Molnár et al. (2015).

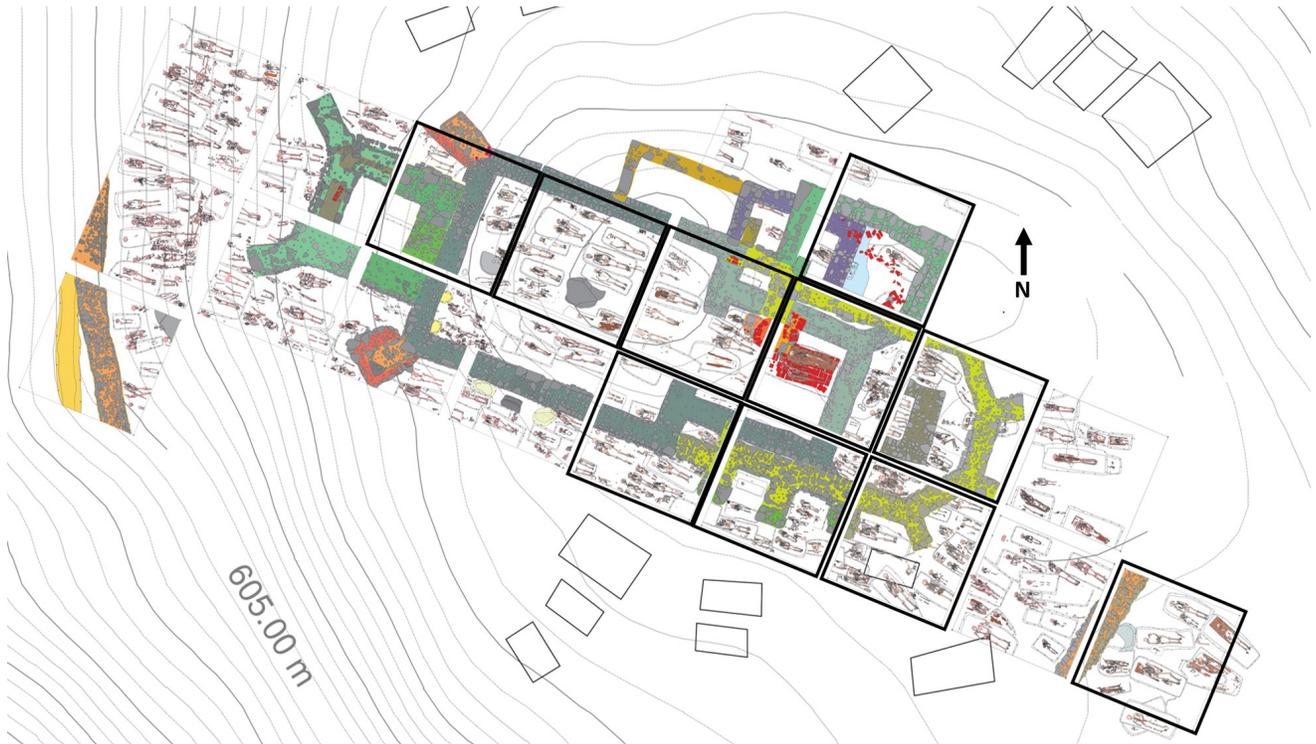


Figure 2. Burial plan map of Papdomb site with 2014 and 2015 trenches outlined.

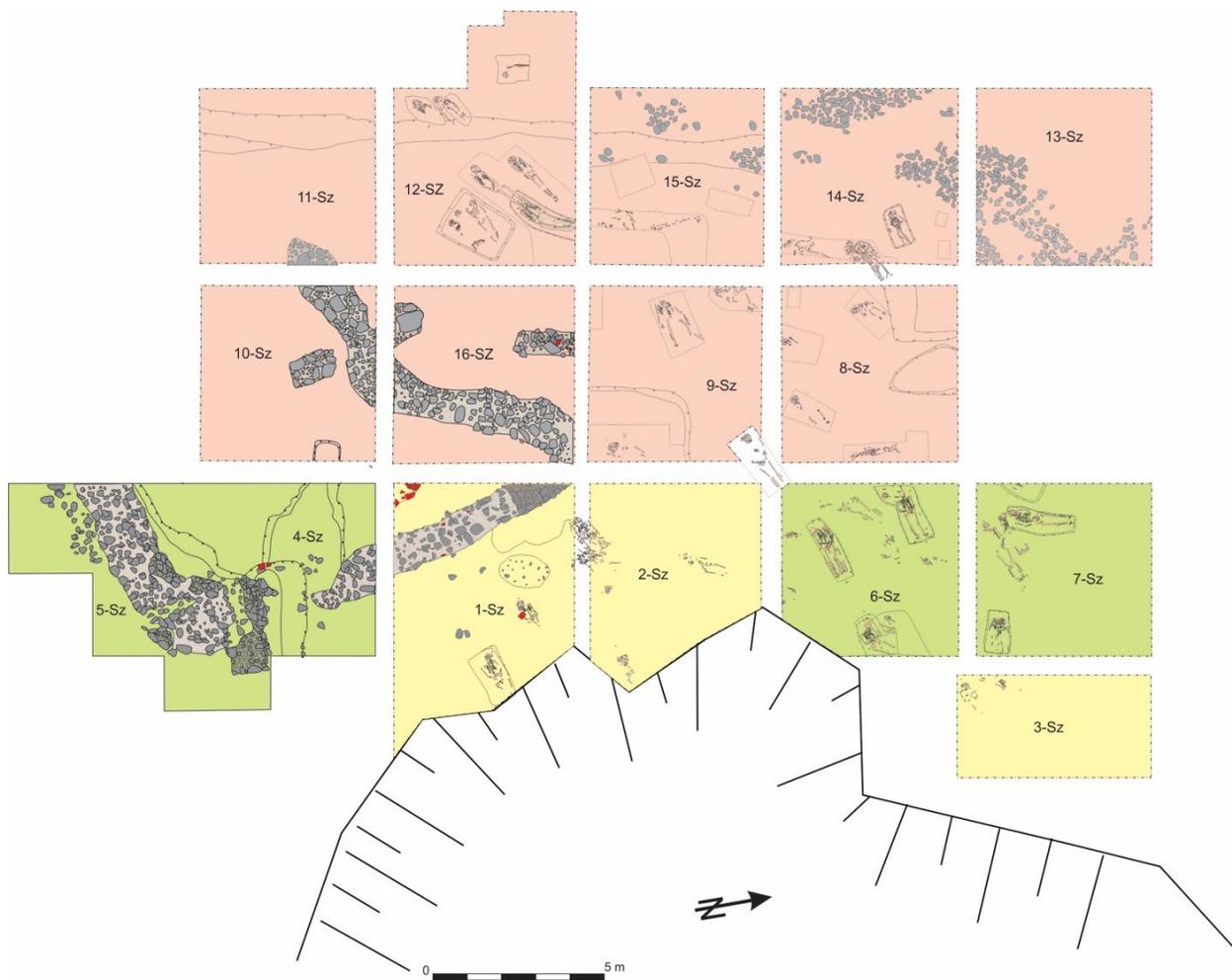


Figure 3. Burial plan map of Fenyéd site burials.

cultural movement from various groups including Slavs, Croatians, Bulgarians, Avars, Franks, Bijelo-Brdo and the first Hungarians (Lendvai, 2004; Ćiplic, 2006). Over the subsequent centuries, populations increased and decreased as a result of political and religious influences, especially from the Tatar invasion of the early 13th century. The medieval population size for Transylvania as a region has been estimated around 250,000 people with 100-200 people in an average-sized village. Mountainous villages, such as the ones in our case study, may have been smaller with difficult to estimate population sizes (Ćiplic, 2006).

The effects of large-scale social changes on small villages in Transylvania are unknown. This information could be gleaned from cemetery data (Ćiplic, 2006), but there has been limited published skeletal research on sites from the Carpathian Basin. Although the Bijelo-Brdo culture predates the two sites discussed herein, Bijelo-Brdo cultural elements are present in Transylvania and associated with early Hungarian sites (10th-11th century). Vodašević and colleagues (2005) report on frequency and location of tooth loss and dental carious lesions from the Bijelo-Brdo archaeological site near Osijek, Croatia. They found that carious dental lesions and antemortem tooth loss increased with age. Antemortem tooth loss was 11.9% among older individuals and 6.7% for all individuals examined. They also found that 46.9% of individuals had at least one carious lesion with 1.8% of younger individuals having at least one carious lesion and 14% of older individuals having at least one carious lesion. Causes for the pattern of dental modification observed were vaguely attributed to diet and lifespan but no direct evidence for antemortem tooth loss or carious dental lesions was provided. In reference to food, Peschel and colleagues (2017) examined the diet of 12th to 19th century Transylvanians excavated from the Bögöz Reformed Church in Mugești (Hungarian: Bögöz), Romania. They found that people were consuming animals fed from native grasses (pigs, sheep, and cows) as well as broomcorn or foxtail millet. They also reported that individuals from the earlier centuries ate less meat and fish.

It is unclear to what degree the Transylvanian villagers participated in available dental or other medical treatments during the medieval period. Westernization in the Székelyföld was visible as early as the 12th century as seen through the presence of a distinct style of hairpin found in association with burials at multiple cemeteries. This finding suggests that mountainous communities might not have been as isolated as assumed (Nyárádi &

Gáll, 2015; Ćiplic, 2006). In terms of dental care and status, members of the noble family from the area were interred at the Papdomb site and do not show any direct evidence of dental treatment. Nor do their teeth appear to have less pathological dental modification than others in the Papdomb cemetery as evidenced by the presence of periapical lesions, carious lesions, and antemortem tooth loss including one edentulous individual.

To further investigate how the oral condition of the two Transylvanian cemetery assemblages compared to other medieval sites, we chose to place the two sites within the broader context of the medieval period in Europe. In doing so, we came across the research challenges described in this paper.

Methods and Materials

One of the goals of this paper is to report on pathological conditions of the oral cavity among medieval Transylvanian Székely communities as a case study to apply the vocabulary and definitions discussed by Pilloud and Fancher (2019) and to demonstrate the challenges of comparison between sites.

Skeletal assemblages from two cemeteries located 18.5km apart in Harghita County, Romania were analyzed. All the burials excavated between 2014 and 2015 have been analyzed and comprise the sample of this study. These graves are from trenches within the walls of the church; within the churchyard, and outside the yard wall (see Figure 2) providing a sample of individuals across the site. A total of 218 burials were removed during the two seasons of excavation (Nyárádi, 2014; Zejdlik, 2015).

All dental elements were sorted and identified by dental arcade, tooth type, and side. Buikstra and Ubleker (1994) and the Arizona State Museum systems were utilized to document dental carious lesions, periodontal recession, antemortem tooth loss, and periapical lesions. Antemortem tooth loss and periapical lesions were not always scorable due to poor preservation of maxillary and mandibular bone.

To acquire data from comparable medieval sites and to test the utility of a standardized language and definitions as called for by Pilloud and Fancher (2019), a literature review was conducted to synthesize data related to conditions of the oral cavity from medieval sites across Europe. Müller and Hussein's 2017 meta-analysis of dental conditions was used as a model as it provided an extensive overview of the literature reporting on 'dental health' from sites between 3,000 BC and the 20th century. We modified their table by extracting only

adults from medieval sites and by removing data on postmortem tooth loss, periodontal disease, and linear enamel hypoplasia. The choice to focus on adults was made to simplify the table; adults were more frequently examined than non-adults. Adults were considered individuals aged 16 years and older. Post-mortem tooth loss was removed from our analysis because it did not provide useful information regarding the condition of the oral cavity. Periodontal disease was removed because only two of the 21 references reviewed reported on it.

The resulting table (Table 1) consists of 21 references reporting on conditions of the oral cavity from medieval peoples across Europe. The 21 references include the two case study cemeteries discussed below. It should be noted that some references report on multiple sites. When possible, the site demographics were broken into male and female. Each dental condition was reported per total available teeth.

Without a set glossary of terms and definitions, one cannot be confident what is being compared. Pilloud and Fancher (2019) have provided recommendations on etiology, skeletal representation, and caution when examining various dental diseases or conditions. In most of the literature cited in Table 1, the authors did not describe etiologies. Instead, emphasis was placed on the physical evidence being observed and the criteria used to assess it. However, in a few cases, such as DeWitte and Bekvalac (2010) and Lopez et al. (2012) a clear and descriptive presentation of conditions and potential etiologies of the oral cavity are presented. A summary of Pilloud and Fancher's (2019) recommendations specifically related to the conditions identified in this paper and reduced to application in observation is provided below:

Antemortem tooth loss: Assessment of this condition should be used cautiously because it has many causes. Investigators should preference a large gap in the dental arcade with evidence of reactive bone. They should also be aware of potential dental agenesis and impaction. If uncertain, antemortem tooth loss should not be recorded.

Carious dental lesions: It is important to differentiate between carious lesions as the physical, dental hard tissue destruction of tooth enamel and, dental caries as the disease process of bacterial fermentation of consumed carbohydrates. The two terms should be used separately.

Periapical lesions: This is a general term to describe a disturbance of the skeletal tissue around the apex of the tooth that may be related to a granuloma, cyst, or an abscess. The general term of 'periapical lesion' is preferred as the specific etiology can be difficult to diagnose without a soft tissue biopsy or a definitive patient history.

Results

A review of the 21 references in Table 1 revealed a range of definitions and etiologies associated with the conditions described. Diagnostic criteria for antemortem tooth loss was reported in a range of ways. In some cases, the criteria to define antemortem tooth loss was not defined (e.g., Lingström & Borrman, 1999; Slaus et al., 1997; Srejić, 2001). In the most simplistic descriptions, it was differentiated from postmortem tooth loss in which there was evidence of an alveolar socket (e.g., Caglar et al., 2007; Esclassan et al., 2009; Vodanović, 2005). Others described antemortem tooth loss as evidenced by alveolar resorption or remodeling (e.g., Chazel et al., 2005; Lopez et al., 2012; Meinel et al., 2010; Novak, 2015; Slaus et al., 2010; Stránská, 2015). Studies did not consider agenesis or impaction as a potential explanation for a lack of tooth presence.

Carious dental lesion criteria were also described in numerous ways. Most authors used the term caries and did not distinguish between the process and the physical manifestation. The majority of the studies identified carious lesions as 'caries' and diagnosed them based on an enamel defect, specifically a pit that could be probed, and made the point to note that discoloration or a sticky lesion was not considered a carious dental lesion (e.g., Belcastro et al., 2007; Meinel et al., 2010; Novak, 2015; Stránská, 2015). Some authors also used radiographic imaging in addition to macroscopic observation to identify carious lesions (e.g., Chazel et al., 2005).

Most papers did not record periapical lesions. Those that did referred to them as abscesses. Diagnostic criteria in the papers described the presence of a perforating fistula as necessary for a diagnosis (e.g., Belcastro et al., 2007; Šlaus et al., 2010). Only Novak (2015) included the description of a sinus present in the alveolus at the apex of the tooth in addition to a perforating fistula as a diagnostic criterion.

Several challenges were identified in the attempt to establish a bioarchaeological context useful for comparison to the Transylvanian Székely case studies, namely the lack of standardization,

Table 1. Summary data on conditions of the oral cavity from medieval archaeological sites

Location/ Time period	Individuals N (male/female/ indeterminate)	Analyzed teeth N total teeth/ N alveolar pres- ence	Antemortem tooth loss N (%)	Carious dental lesions per tooth N (%male/ % female)	Periapical lesions per tooth N (%male/ % female)	Reference
Ireland (rural) 400 -1000 AD	167(85/82/-)	3233	ND (9.7%)	98(2.5%/3.6%)	85 2.3%	Novak 2015
Italy (rural), 700 AD	88 (45/40/3)	1754/ND	ND (14%)	263 (15%/ 15%)	4.5%	Belcastro et al. 2007
Austria (urban), 700-800 AD	136 (64/72/-)	2215/3649	869 (24%)	331 (15%)	ND	Meinl et al. 2010
Czech Republic (rural) 800- 1100AD	241 (-/-/-)	1006/1011	0	6 (0.06%)	ND	Stránská et al. 2015
Czech Republic (urban) 800- 1100AD	487 (-/-/-)	1538/2699	0	18 (0.012%)	ND	Stránská et al. 2015
Croatia (rural) 700-1100 AD	151(59/38/-)	2707/ND	21.7%	318(11.1%/12.6%)	196 5.1%	Šlaus et al. 2010
Croatia (urban) AD 1100- 1400	107(63/44/-)	643/1378	ND- data com- bined with abs- cesses	62 (11%/7.6%)	ND- data com- bined with ante- mortem tooth loss	Novak et al. 2012
Croatia (rural), 10 -11 th century	81 (-/-/-)	923/ 1414	99/7% all	92/ 10%	ND	Vodanović et al. 2005
France (urban), 11 -15 th	107 (-/-/-)	1183/3424	342 (10%)	107 (9%)	ND	Chazel et al. 2005
France (rural), 12 -14 th	58 (29/29/-)	1395/1822	121 (7%)	250 (22%/ 14%)	ND	Esclassan et al. 2009
Scotland (rural), 1240-1440	561 (-/-/-)	9991/ND	7% all	709/ 7%	ND	Watt et al. 1997
Papdomb, Roma- nia (rural) 14 th -15 th	60 (34/21/5)	1074 /ND	ND	12.4%	16 (1.4%)	Current study
Fenyéd-Bradesti, Romania (rural) 11 - 12 th	32 (-/-/-)	569/ND	ND	24.44%	1 (0.2%)	Blevens and Adams 2017
England (urban), AD 1350-1538	190 (-/-/-)	ND	ND	484 (premolars and molars only) 27.3%	ND	DeWitte & Bekvalac 2010
Turkey (urban), 13 th	52(-/-/-)	261/ND	51 (6.9%)	8 (15.38%)	ND	Caglar et al. 2007
Spain (rural), 15 th	240 (123/117/-)	1015/1254	239 (19%)	48 (5%/ 4%)	ND	Lopez et al. 2012
Scotland (urban), 13-16 th	52 (-/-/-)	984/1246	60/ 4% all ages	54/ 5%	ND	Kerr et al. 1988
Serbia (rural), 14- 16 th	369 (-/-/-)	1680/2874	299 (10%)	149 (9%)	24 (1.4%)	Srejic 2001
Finland (urban, poor people), 15- 16 th	294 (-/-/-)	4581/ 5803 Deciduous 600/600	622/11% all ages	731/16%	ND	Varrela 1991
Scotland (urban), medieval	74 (-/-/-)	1614/ 1958 Pre 255/ 279	156/8% all ages	134/8% 5/7%	ND	Kerr et al. 1990
Sweden (urban), 1621-1640	63 (-/-/-)	936/1997 Pre 13/48	55/3% all ages	106/11%	ND	Lingström and Borrman 1999
Croatia (rural), 14 -17 th	68 (35/33/-)	765/ND	ND	72 (9%)	ND	Šlaus et al. 1997
France (urban), 16 -17 th	109 (-/-/-)	1267/3488	519 (15%)	236 (19%)	ND	Chazel et al. 2005

*ND= no data or not specified

which made overall construction of Table 1 complicated. There were various forms of missing data and different reporting styles especially in terms of demographics. Additionally, the lack of standardization in description of conditions of the oral cavity suggests that while there was a general understanding of processes and analytical methods, there were certainly areas of concern regarding recorded data.

The data from Table 1 was distilled into descriptive statistics per condition. The numbers provided by each reference were broken down into the minimum percentage of the condition expressed, the maximum, and the mean. Not all references investigated all of the conditions reported in Table 1. The N column provides the number of references out of 21 that reported the condition. The results of the Transylvanian analysis were added to the bottom of the table to highlight how the Transylvanian cases fit into the general data on the medieval oral condition.

Of the 21 references reviewed in Table 1, 18 reported on antemortem tooth loss. Antemortem tooth loss occurred at variables rates across medieval sites with 0% reported for sites in the Czech Republic (Stránská et al., 2015) and 24% reported for a site in Austria (Meinl et al., 2010). The average number of total teeth lost antemortem across the sites recoded in Table 1 was 10.4%. Antemortem tooth loss was not recorded for the Papdomb or Fenyéd individuals for taphonomic and preservation reasons

Information regarding carious dental lesions from the two Transylvanian sites was examined against the descriptive statistics provided in Table 2. All of the 21 references reviewed in Table 1 reported on carious lesion prevalence. Like antemortem tooth loss, dental carious lesions were reported at variables rates across medieval sites with 0.6% reported for sites in the Czech Republic (Stránská et al., 2015) and 27.3% reported for a St. Mary Graces cemetery site in England (DeWitte & Bekvalac, 2010). The average total teeth with carious lesions across the sites recoded in Table 1 was 10.3%. Interestingly, the numbers for antemortem tooth loss and carious dental lesions across the sites are very similar. Also in both cases, the sites from the Czech Republic have the lowest numbers. When the two Transylvanian sites were compared to descriptive statistics in Table 2, the Papdomb site (12.4%) was just above the overall mean (10.3). However, the Fenyéd site (24.4%) was high. It was the second highest reported after the St. Mary Graces cemetery (27.3%). Both Transylvanian sites

are higher than the Bijelo-Brdo culture site (7%) to which they are most culturally similar.

Reporting of periapical lesions was limited. Of the 21 references in Table 1 only 6, including the two case studies, provided data. The lowest reported prevalence was the Fenyéd site case study (0.2%) and the highest (5.1%) reported was an aggregation of three, Early Medieval villages in Croatia (Šlaus et al. 2010). The Papdomb site had a frequency of 1.4%, which was the second lowest rate.

Discussion

The Fenyéd site had the second highest frequency of carious dental lesions among all 21 references reviewed and the lowest frequency of periapical lesions. The Papdomb site was slightly above average for frequency of carious lesions and had the second lowest frequency of periapical lesions. The two cemeteries were 18km away from each other and were used at the same time. Both were in rural Transylvania in a hilly area of the Carpathian Basin. They were, and remain, small villages with similar people, similar occupations, and similar access to resources. The two skeletal populations demonstrate very limited evidence of trauma or pathological indicators minus the expected occurrences of osteoarthritis and other common degenerative modifications in older individuals. All things considered, it had been assumed that the two sites would have had similar conditions of the oral cavity. It is possible that sample size, 32 adults from Fenyéd versus 60 adults from Papdomb, could have impacted the results. Regardless, the difference suggests that other factors were present and point in a direction of further investigation.

Conclusions

Health is a vague term that encompasses physical, emotional, mental, and social factors. To adequately study health requires patient histories and a better understanding of etiological factors. It is difficult to interpret in the bioarchaeological record. It is limited by the inherent attributes of archaeological skeletal assemblages. However, as bioarchaeologists we are tasked with finding ways to overcome those challenges in investigation and interpretation to best represent the people we are speaking about.

Situating interpretation within the social and cultural context of a specific time and place is important even if it is indirect and acquired through less utilized means of knowing, such as images and folklore. This has become apparent in our research among the Székely of Transylvania whose

own origin story is unknown and has written itself out of lore and legend (Lemdvai, 2004). Next, applying bioarchaeological data at various scales provided different perspectives on the variability across time and place even though it all fell under the classification of 'medieval.' Specifically, this study demonstrated that the oral cavity was variable across medieval Europe even in cases with similar contexts such as transitions from Late Antiquity to the Early Medieval period, sites in Croatia and Romania with similar cultural periods, or two rural, Székely, Transylvanian villages. Finally, further complicating the situation was a lack of standardization in descriptions and reporting, which underscores the call of Pilloud and Fancher (2019) to standardize terminology and further understand the etiology of processes that affect the oral cavity; hopefully, leading to improvements in data reporting. We will never know what ancient individuals experienced or perceived in terms of their dental health but we can be more responsible in the way we discuss it.

Table 2: Descriptive statistics of the data reported in Table 1 with the Transylvanian sites highlighted for comparison

	Antemortem Tooth Loss (n= 18)	Carious Den- tal Lesions (n=21)	Periapical lesions (n=6)
Min	0%	0.6%	0.2%
Max	24%	27.3%	5.1%
Average	10.4%	10.3%	3.3%
Papdomb	ND	12.4%	1.4%
Fenyéd	ND	24.44%	0.2%

REFERENCES

- Anderson, T. (2004). Dental treatment in Medieval England. *British Dental Journal*, 197(7), 418-425.
- Belcastro, G., Rastelli, E., Mariotti, V., Consiglio, C., Facchini, F., & Bonfiglioli, B. (2007). Continuity or discontinuity of the life-style in central Italy during the Roman imperial age-early middle ages transition: Diet, health, and behavior. *American Journal of Physical Anthropology*, 132(3):381-394.
- Bethard, J.D, Osterholtz A.J., Nyárádi Z, & Gonciar, A. (2019). Marginalized Motherhood: Infant burial in seventeenth-century Transylvania. In C.I. Tica & D.L. Martin (Eds.), *Bioarchaeology of Frontiers and Borderlands* (pp. 252-272). Gainesville, FL: University Press of Florida.
- Betsinger, T.K., & DeWitte, S. 2017. Trends in mortality and biological stress in a medieval polish urban population. *International Journal of Paleopathology*, 1, :24-36.
- Blevins, B., & Adams, D. (2017). *Dental stress markers of a Medieval Transylvanian population*. Paper presented at the 86th annual meeting of the American Association of Physical Anthropologists, New Orleans, LA.
- Bifulco, M., Amato, M., Gangemo, G., Marasco, M., Caggiano, M., Amato, A., & Pisanti, S. (2016). Dental care and dentistry practice in the Medieval Medical School of Salerno. *British Dental Journal*, 221(2), 1-3.
- Buikstra, J.E., & Ubelaker, D.H. (1994). *Standards for data collection from human skeletal remains: proceedings of a seminar at the Field Museum of Natural History*, organized by Jonathan Haas: Arkansas Archeological Survey.
- Caglar, E., Kuscu, O., Sandalli, N., & Ari, I. (2007). Prevalence of dental caries and tooth wear in a Byzantine population (13th cad) from north-west Turkey. *Archives of Oral biology*, 52(12), 1136-1145.
- Chazel, J-C., Valcarcel, J., Tramini, P., Pelissier, B., & Mafart, B. (2005). Coronal and apical lesions, environmental factors: study in a modern and an archeological population. *Clinical Oral Investigations*, 9(3), 197-202.
- Clarke, N.G., & Hirsch, R.S. (1991). Physiological, pulpal, and periodontal factors influencing alveolar bone. In M.A. Kelly & C.S. Larsen (Eds.), *Advances in Dental Anthropology* (pp. 241-266). New York: Wiley-Liss.
- DeWitte, S.N., & Bekvalac, J. (2010). Oral health and frailty in the medieval English cemetery of St Mary Graces. *American Journal of Physical Anthropology*, 142(3), 341-354.
- Esclassan, R., Grimoud, A., Ruas, M., Donat, R., Sevin, A., Astie, F., Lucas, S., & Crubezy, E. (2009). Dental caries, tooth wear and diet in an adult medieval (12th-14th century) population from Mediterranean France. *Archives of Oral Biology*, 54(3), 287-297.
- Irfan, U.M., Dawson, D.V., & Bissada, N.F. (2001). Epidemiology of periodontal disease: a review and clinical perspectives. *Journal of International Academy of Periodontology*, 3(1), 14-21.
- Jouanna, J. (2012). The Legacy of the Hippocratic Treatise The Nature of Man: The theory of the four Humours. In P. van der Eijk (Ed.), *Greek Medicine from Hippocrates to Galen* (pp. 335-359).

- Leiden, Netherlands: Brill.
- Kerr, N. (1990). The prevalence and pattern of distribution of root caries in a Scottish medieval population. *Journal of Dental Research*, 69(3), 857-860.
- Kerr, N., Bruce, M., & Cross, J. (1988). Caries experience in the permanent dentition of late mediaeval Scots (1300-1600 AD). *Archives of Oral Biology*, 33(3), 143-148.
- King, H. (2013). Female Fluids in the Hippocratic Corpus: How Solid was the Humoral Body? In P. Horden, & E. Hsu (Eds.), *Humoral Medicines in Practice* (pp. 25-52). New York, NY: Berghahn Books.
- Lendvai, P. (2004). *The Hungarians: a thousand years of victory in defeat*. Princeton, NJ: Princeton University Press.
- Lingström, P., & Borrman, H. (1999). Distribution of dental caries in an early 17th century Swedish population with special reference to diet. *International Journal of Osteoarchaeology*, 9(6), 395-403.
- Lopez, B., Pardiñas, A., Garcia-Vazquez, E., & Dopico, E. (2012). Socio-cultural factors in dental diseases in the Medieval and early Modern Age of northern Spain. *Homo: Internationale Zeitschrift für die vergleichende Forschung am Menschen*, 63(1), 21-42.
- Meinl, A., Rottensteiner, G., Huber, C., Tangl, S., Watzak, G., & Watzek, G. (2010). Caries frequency and distribution in an early medieval Avar population from Austria. *Oral Diseases*, 16(1), 108-116.
- Molnár, Z. M. (2001). *A concise history of Hungary*. Cambridge: Cambridge University Press.
- Molnár, Z., Gellény, K., Margóczy, K., & Biró, M. (2015). Landscape ethnoecological knowledge base and management of ecosystem services in a Székely-Hungarian pre-capitalistic village system (Transylvania, Romania). *Journal of Ethnobiology and Ethnomedicine*, 11(3), 1-22. <http://www.ethnobiomed.com/content/11/1/3>
- Müller, A., & Hussein, K. (2017). Meta-analysis of teeth from European populations before and after the 18th century reveals a shift towards increased prevalence of caries and tooth loss. *Archives of Oral Biology*, 73, 7-15.
- Novak, M. (2015). Dental health and diet in early medieval Ireland. *Archives of Oral Biology*, 60(9), 1299-1309.
- Novak, M., Martinčić, O., Strinović, D., & Šlaus, M. (2012). Skeletal and dental indicators of health in the late mediaeval (12-15th century) population from Nin, southern Croatia. *HOMO- Journal of Comparative Human Biology*, 63(6), 435-450.
- Nyárádi, Z. (2013). A Fenyédi Csonkatemplom régészeti feltárása. Paper presented at the Haáz Rezső Museum. Székelyudvarhely, Romania.
- Nyárádi, Z. (2015). Report De Cercetare Arheologică Preventivă. Văleni-„Papdomb” Biserica medieval. Campania 2015. Muzeu Haás Rezső Museum.
- Nyárádi, Z., & Gáll, E. (2016). The 'westernization' of the Transylvanian Basin: Migration and/or acculturation?: Wearing hairpins in the 12th century Transylvanian Basin. *Vjesnik Arheološkog muzeja u Zagrebu*, 48(1), 85-120.
- Pelling, M. (1998). *The common lot: Sickness, medical occupations and the urban poor in early modern England*. London: Routledge.
- Peschel, E. M., Dunn, T. E., Bethard, J. D., Nyaradi, Z., Gonciar, A., Katzenberg, M. A., & Ambrose, S. H. (2017, April). Reconstructing Szekely subsistence: Stable isotope evidence for medieval diet in eastern Transylvania. *American Journal of Physical Anthropology*, 162, 314.
- Pilloud, M.A., & Fancher, J.P. (2019). Outlining a definition of oral health within the study of human skeletal remains. *Dental Anthropology*, 32(2), 3-11.
- Reitsema, L.R., & McIlvaine, B.A. (2014). Reconciling "stress" and "health" in physical anthropology: What can bioarchaeologists learn From the other subdisciplines?. *American Journal of Physical Anthropology*, 155, 181-185.
- Šlaus, M. (2008). Osteological and dental markers of health in the transition from the Late Antique to the Early Medieval period in Croatia. *American Journal of Physical Anthropology*, 136(4), 455-469.
- Šlaus, M., Bedić, Ž., Šikanjić, P.R., Vodanović, M., & Kunić, A.D. (2010). Dental health at the transition from the Late Antique to the early Medieval period on Croatia's eastern Adriatic coast. *International Journal of Osteoarchaeology*, 21(5), 577-590.
- Šlaus, M., Pečina-Hrnčević, A., & Jakovljević, G. (1997). Dental disease in the late medieval population from Nova Rača, Croatia. *Collegium Antropologicum*, 21(2), 561-572.
- Srejić, M.D. (2001). Dental paleopathology in a Serbian medieval population. *Anthropologischer Anzeiger*, 59(2), 113-122.
- Stránská, P., Velemínský, P., & Poláček, L. (2015). The prevalence and distribution of dental caries in four early medieval non-adult populations of different socioeconomic status from

- Central Europe. *Archives of Oral Biology*, 60(1), 62-76.
- Tiplic, I. M. (2006). *Transylvania in the early Middle Ages: (7th-13th c.)*. Arbeitskreis für Siebenbürgische Landeskunde (Working Group for Transylvanian Archaeology).
- Varrela, T.M. (1991). Prevalence and distribution of dental caries in a late medieval population in Finland. *Archives of Oral Biology*, 36(8), 553-559.
- Vodanović, M., Hrvoje, B., Mario, Š., & Željko, D. (2005). The frequency and distribution of caries in the mediaeval population of Bijelo Brdo in Croatia (10th-11th century). *Archives of Oral Biology*, 50(7), 669-680.
- Watt, M.E., Lunt, D.A., & Gilmour, W.H. (1997). Caries prevalence in the permanent dentition of a mediaeval population from the south-west of Scotland. *Archives of Oral Biology*, 42(9), 601-620.
- World Health Organizaton. (1948, April 7). Preamble to the Constitution of WHO as adopted by the International Health Conference, New York, 19 June - 22 July 1946; signed on 22 July 1946 by the representatives of 61 States. *Official Records of WHO* 2:100. <https://www.who.int/about/who-we-are/frequently-asked-questions>
- Zejdlik, K. (2015). Archaeotek Summer Field Season 2015: Medieval Funerary Excavations at Papdomb, Patakfalva. On file with ArchaeoTek Canada, LLC.