



# Sex-related risks of trauma in medieval to early modern Denmark, and its relationship to change in interpersonal violence over time



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## ABSTRACT

Skeletons from three Danish cemeteries, Sortebrødre, Tirup, and St. Mikkel, that collectively held 822 adults (>15 years) and spanned the medieval to early modern periods (ca. AD 1100–1610) show that men, in general, experienced more bone fractures than women. Men were three times more likely to have healed cranial vault and ulnar shaft fractures than women, with many of these bones presumably broken in interpersonal violence. More women, however, broke distal radii, presumably often the result of falls. Both sexes suffered more cranial fractures than modern Danes, with the proportional difference for men and women being about the same. The difference in cranial trauma frequencies between historic-period and modern Danes has implications for a decline over the past several centuries in interpersonal violence that scholars in other disciplines have inferred from historical sources.

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## 1. Introduction

Bone fractures resulting from accidents, intentional violence, or excessive activity-related stress (fatigue fractures) provide valuable perspectives on people's lives in the distant past that cannot be gleaned from other sources (Judd and Redfern, 2012; Lovell, 2008; Walker, 2001). That includes trauma attributable to interpersonal violence where much of the archaeological literature on skeletons and other remains focuses on prehistoric small-scale societies (Keeley, 1997; Martin and Frayer, 1997; Martin et al., 2012; Schulting and Fibiger, 2012). Yet there is also a growing body of literature on various forms of skeletal trauma in the historic period, including medieval Europe (Agnew and Justus, 2014; Arcini, 1999; Brødholt and Holck, 2012; Djurić et al., 2006; Gejvall, 1960; Grauer and Roberts, 1996; Judd and Roberts, 1998, 1999; Kjellström, 2014; Myszka et al., 2012; Novak and Šlaus, 2012; Power, 1994; Stirland, 1996; Šlaus et al., 2012; Walker, 2012).

Here medieval to early modern Danish skeletons are used to provide a perspective on trauma in a pre-industrial state-level European society. Healed fractures are emphasized because they are reasonably common in skeletal samples and easily identified.

While it is rarely possible to be certain about the origin of trauma in specific skeletons (an exception is heavy sharp-edged weapon damage), general tendencies in fractures that frequently result from violent encounters as opposed to accidents can be equally informative on a population level.

Healed fractures represent a lifetime accumulation of signs of severe trauma. Yet contrary to what might be expected, frequencies of antemortem trauma in archaeological samples cannot simply be assumed to increase monotonically with advancing age. Mortality samples are enriched at each age by individuals with conditions associated with an increased risk of dying, with some of those conditions visible in skeletal remains (Boldsen and Milner, 2012; Wood et al., 1992; Wright and Yoder, 2003). If having a healed fracture is associated with an elevated risk of dying, then people with broken bones would be more likely to enter the cemetery sample than their uninjured counterparts of the same age. Perhaps these individuals experienced a lifetime of greater exposure to hazardous situations where bones were broken at a higher rate than they were in other segments of the community. It could also result from an elevated risk of dying among the survivors of trauma through disabilities acquired from the initial injury. That is most likely to occur, or at least be measurable in small archaeological samples, for neurocranial fractures leading to traumatic brain injuries.

Of special interest is whether differences can be detected in trauma frequencies for Danish men and women. That is a first step toward identifying the hazards of daily life that affected different

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segments of communities in pre-industrial northern Europe. In medieval and early modern Scandinavia, the doorstep was customarily the dividing line between male and female workplaces (Holtmark, 1981). This sexual division of labor is likely to leave a detectable signature on the human skeleton, although both sexes performed hard labor that could result in broken bones (Hanawalt, 1986; Hybel and Poulsen, 2007; Rösener, 1992).

Skeletal trauma attributable to interpersonal violence has the potential for furthering our understanding of what seems to have been a general decline since the Middle Ages in the combined effect of intergroup conflict (war in its various forms); depredations by outlaw bands; assaults of all kinds within communities, including domestic abuse, fighting, and homicide; and culturally sanctioned corporal punishment of malefactors (Eisner, 2001, 2003, 2014; Gurr, 1981; Muchembled, 2012; Österberg, 1996; Pinker, 2011, 2013; Sharpe, 1996; Spierenburg, 1996, 2001; Stone, 1983). This interpretation of the historical record recently captured the public's attention through Pinker's (2011) work, although the evidentiary basis for such a decline is not without its detractors (Schwerhoff, 2002)<sup>1</sup>.

Evidence for trauma severe enough to damage skeletons is one of the few means available of assessing the direction and magnitude of such trends independent of written materials. That is especially important because early documents rarely contain sufficient detail to quantify behavior, especially when populations are divided into categories defined by sex, age, social position, and the like. Here rough estimates of differences between the historical and modern Danish populations in cranial trauma, much of it attributable to interpersonal violence, are derived from archaeological skeletons and recent hospital data from the same geographical area.

## 2. Cultural context

The skeletons came from three Danish cemeteries. Collectively, the sites span over a half millennium from the medieval to early modern (post-Reformation) periods.

Tirup, the earliest cemetery dating to ca. AD 1150–1350, was located in east-central Jutland. Of the three burial areas, it was the only one that was completely excavated. The graves were arranged around two successive churches, with the entire complex surrounded by a ditch that demarcated the sacred area (Boldsen et al., 1985). The churchyard was used by members of a rural village probably occupied by about 75 people. Most, if not all, of these people must have been involved in agricultural work because there were few, if any, alternatives for the residents of small rural villages. Although men and women had different roles in their households, both sexes were engaged in heavy physical activity that put them in proximity to large, and sometimes dangerous, farm animals. The village disappeared without a trace in the mid-fourteenth century, and the cemetery was only found by accident during industrial development that subsequently led to a salvage excavation (Boldsen, 2002). It was not at all uncommon for villages to be abandoned at that time in Denmark (Hybel and Poulsen, 2007).

<sup>1</sup> It is important to distinguish what took place from the Middle Ages to the present from comparisons of prehistoric small-scale societies and modern nation states (including near-recent ones). Pinker's (2011) discussion of prehistoric societies is thin, and its shortcomings have been covered, in part, elsewhere (Ferguson, 2013). Such anthropological criticisms, however, do not address the bulk of Pinker's (2011) book, including virtually all the data he presented that mainly pertains to the last half millennium or so. Scholars who agree that violence in economically developed nations has declined over the past several centuries differ over why that has happened and what the future holds in store for humankind (Gat, 2012; Eisner, 2001, 2003, 2014; Levy and Thompson, 2013; Muchembled, 2012; Österberg, 1996; Pinker, 2011; Spierenburg, 2001; Thayer, 2013).

St. Mikkel in north-central Jutland dates to ca. AD 1100–1529. The partially excavated cemetery was positioned just outside a wall that once surrounded Viborg, although it is within the present-day limits of the city (Boldsen, 1979). There were two churches. The first, which probably dated to the eleventh century, was not directly observable in the excavation, although the existence of a presumably wooden building was indicated by the arrangement of graves that held poorly preserved skeletons. None of those skeletons met the inclusion criteria for this paper (see below). More recent burials, dating from the early twelfth century to 1529, were associated with a stone church (Boldsen, 1979; Vellev, 1979). St. Mikkel was one of the first churches to be established in the vicinity of Viborg, which later became the home of several additional parishes along with monasteries and a cathedral (Kristensen, 1999). The cemetery was used by people of low socioeconomic status who resided on the outskirts of what was, for its time, a large town occupied by upwards of 4000 people (Petersen et al., 2006). They probably supported themselves through work that often involved heavy labor in the surrounding fields and town.

The Sortebrødre cemetery, located within the city limits of Odense on the large island of Fyn, dates to ca. AD 1240–1610 (Boldsen and Møllerup, 2006). It was associated with a Dominican monastery (Christensen, 1988). The monastery was shut down during the Reformation, but the people of Odense continued to use the cemetery for several more generations. In fact, most burials postdate the 1530s Reformation when the town was inhabited by at least as many people as medieval Viborg. For the most part, these people were also involved in heavy physical work, although they often would have earned a living in the trades or as laborers, as opposed to agricultural activities. The entire burial area was not excavated – it is presently a market square – but hundreds of graves were found, making it the largest of the three samples. Because it is located in a heavily occupied part of Odense, the full size and layout of the monastic complex is unknown.

There remains the issue of whether the burials were representative of their communities. That is not a concern for Tirup, as the graveyard was entirely excavated. All members of rural villages could expect a Christian burial, and communities such as Tirup typically had only one church. Only part of the cemetery surrounding St. Mikkel's stone church was excavated. Nevertheless, these skeletons are unlikely to be a biased sample because elsewhere there is no evidence for a spatial differentiation in churchyard use along the lines of what is of interest here: sex, age, and trauma long prior to death. Although the full extent of the Sortebrødre burial area is not known, the graves are from all structural elements of the monastic complex (i.e., the cloister, courtyard, church, and surrounding churchyard). Because of their distribution, the skeletons are likely representative of the people interred there. Monasteries, in turn, were preferred burial places for people who lived near them, including those who died after the Reformation. The Sortebrødre grounds continued to be used as a parish cemetery by the people of central Odense until the area was eventually transformed into a market square (Christensen, 1988).

Taken together, the three sites represent a sampling of the diversity of living conditions that existed during a period roughly spanning a half millennium. Denmark at that time was a unified state with centralized political and ecclesiastical authority, but most people still lived in small settlements and practiced an agricultural way of life. This period of Danish history spanned changes in socioeconomic systems and concomitant pathogen exposure, especially to diseases spread through increasingly frequent communication with distant parts of Europe. Conditions at that time, however, can be contrasted with those associated with the great expansion of cities, population growth, and economic diversification that accompanied rapid industrialization in the late nineteenth century that led to Denmark as we know it today.

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