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The role of modern malnutrition in modelling Roman malnutrition: Aid or anachronism?

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ABSTRACT

This paper shows how insights pertaining to modern malnutrition may be of use in modelling Roman malnutrition. It also points out some of the dangers and pitfalls of applying modern insights, data and *a priori* suppositions to the past. We approach this topic from two perspectives that challenge some of the implicit and explicit assumptions regarding the similarities and dissimilarities between ancient and modern malnutrition. First we argue that a degree of malnutrition is part of the human condition and that economic growth may only limitedly remedy it. Indications of past malnutrition are therefore of limited value in judging economic performance. Secondly we show that the nutritional value of cereals has been underestimated by historians and archaeologists, especially in terms of trace element content (colloquially: 'minerals'), while their role in the diet has been overestimated. Both aspects have undergone great changes during the Green Revolution of the mid-20th century due to dilution due to extreme yield increases and unforeseen side effects of genetic modification. As neither Roman nor any other pre-20th century cereals could have been subject to such changes, our view on the role of cereals in Roman diet and nutrition needs to be revised.

1. Introduction: the argument

This review paper aims to show how insights pertaining to modern malnutrition may be of use in modelling Roman malnutrition. However, it also points out some of the dangers and pitfalls of applying modern insights, data and *a priori* suppositions to the past. We will approach this topic from two perspectives that challenge some of the implicit and explicit assumptions regarding the similarities and dissimilarities between ancient and modern malnutrition. The first section provides a brief overview of how the approach of modern historians to malnourishment in the Roman world developed over the past decades. In the second section we will emphasize the ubiquity of malnutrition and its many forms in the modern world and argue that malnutrition was part of the human condition in the past as it is in the present, and very likely, the foreseeable future. On the one hand, we aim to contextualize the occurrence and evidence for ancient malnutrition, while on the other hand we will show how the modern relationship between economic growth, labour productivity and malnutrition may be of help in modelling this relationship for the Roman period. In the third section we will discuss some dissimilarities between ancient and modern malnutrition. We will focus on the effects of the 20th century Green Revolution, which while it increased agricultural productivity, it also negatively affected the micronutrient content of cereals and increased the proportion of cereals in the diet. We will point out the aspects and processes responsible for modern malnutrition that are anachronistic if applied to the Roman period. We will argue that the use of post-Green Revolution biochemical insights, agro-statistics and ethnographic data has affected our view of the nutritional quality of cereals and of the diversity of past diets, leading to an overestimation of the role of cereals.

2. Roman diet and nutritional deficiencies: past and current perspectives

The research by Robert Fogel (2004, 2012) and Amartya Sen (1981) on long-term developments in living standards and nutrition has been very influential on ancient historians and archaeologists in determining their research questions and expectations regarding diet and (mal)nutrition in the ancient world. Fogel pointed out that widespread malnutrition among the workforce in early modern Europe severely limited labour productivity. Social inequality, low labour productivity, and prevalent diseases, which impaired the ability of the human body to absorb nutrients despite a potentially adequate diet, kept nutrition and living standards low. Fogel explained that economic growth in the

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recent past to a significant extent followed from improvements in health care and diet (Fogel, 2004). Some groups were more vulnerable in this regard than others, as Sen pointed out. Using the concept of entitlement, he identified women and children, the urban poor and rural day-labourers in particular as being in a weak position and faring economically worse than their male counterparts (Sen, 1981). Inspired by these scholars, Peter Garnsey in his studies of diet and nutrition in the ancient world rightly spoke out against the naïve idea that societies that boasted such tremendous achievements as the Greeks and Romans did, must have consisted of healthy, well-fed populations (Garnsey, 1999). While scholars working in ancient history lacked the data on food consumption available to Fogel, there was reason to postulate similar – if not worse – levels of malnourishment and malnutrition in the Roman world. Skeletal remains on the one hand indicated a high occurrence of nutritional deficiencies as a result of inadequate intake or diseases; on the other hand a relatively short stature among ancient populations was interpreted as reflecting low living standards.

Recently, however, viewpoints on the omnipresence of malnutrition in the pre-industrial world have significantly changed. Gregory Clark (2007) offers a strong argument against the teleological assumption that there is a steady upward trend regarding diet and nutrition in human history. Long-term developments in agricultural productivity – the invention of agriculture itself, he stresses (cf. Armelagos et al., 1991) – had not resulted in steadily better fed people, but only in more people, who generally had to work harder than their predecessors (cf. Boserup, 1965). In other words, simply because 18th-century France or 19th-century England, or modern developing countries for that matter, counted many malnourished individuals does not mean that the same must have applied to ancient Rome.

Stature has been used in historical research as a proxy for living standards and nutrition, indicating general long-term changes between societies. One such study pointed out that average height increased after the fall of the Roman Empire, only to drop again when population levels rose in the high Middle Ages; average height then increased again when the Black Death of the 14th century decimated the European populace. In other words, high population density in the Roman world had put pressure on living standards, which was reflected in shorter stature (Koepke and Baten, 2005; likewise Giannecchini and Moggi-Cecchi, 2008, cf. Kron, 2005). Apart from the small and often biased data sets for some periods (for instance, most Roman skeletons derive from urban graveyards, cf. Flohr, forthcoming), the correlation between stature on the one hand and health and nutrition on the other is not straightforward. Potential height is to a large extent determined by genetic conditions, while many other elements in the relationship between the individual and his/her (anthropogenic or natural) environment govern the extent to which this potential is reached. Higher population densities and urbanization rates in the Roman world for instance could have resulted in more arable farming and less animal husbandry as more calories can be produced per land unit in the former strategy; consequently, a smaller intake of animal protein, though not necessarily of calories, could have reduced height (Koepke and Baten, 2005, 65, 81).

The analysis of archaeological skeletal and dental remains seemed to confirm the expected commonness of malnourishment in the Roman world. Combining textual evidence with osteological indicators of nutritional deficiencies, Garnsey (1999, 51) concluded that the prevalence of malnutrition associated with the inadequate intake of specific vitamins and minerals could be regarded as established. Indeed, the occurrence of malnutrition need not be doubted, but the extent to which such deficiencies characterized the nutrition of ancient populations is a different matter. In the past decades, specialists in the field of paleo-osteology have warned historians not to jump to conclusions. Take for example iron-deficiency anaemia. Although it was realized that anaemia could be caused by both disease and diets deficient in iron, the frequency with which anaemia was observed in the skeletal remains seemed to confirm the hypothesis of widespread malnourishment (Garnsey, 1999). More recently, however, it has been shown that the most commonly observed pathological condition in archaeological skeletal material used to attest iron-deficiency anaemia, porotic hyperostosis, besides dietary causes may follow from many other factors as well, such as parasites, genetic conditions, infectious disease and lead poisoning (cf. Walker et al., 2009). The latter cause may have been an even greater problem in the cities of the Roman world than in other early societies, due to the common use of lead pipes, though lead poisoning caused by poorly glazed earthenware, tin vessels, wine-making and general pollution was a common phenomenon in pre-modern societies (Waldron, 2006; McKinnon, 2007). Moreover, the frequency with which this condition is diagnosed shows great variability between sites, which may be related to lack of standardization, inter-observer differences (Killgrove, forthcoming), and – one may add – *a priori* assumptions. In short, porotic hyperostosis is only a weak indicator of inadequate iron intake.

The challenge for future research is not only to draw up more nuanced models of (mal)nutrition in the Roman world, but also to distinguish between groups of different age, gender and social position. Recent studies observe variation in stable isotope characteristics of human remains, indicating differences in diet, but these divergences allow for only very broad conclusions. Examples include determining trophic level, the balance between terrestrial and marine foodstuffs and attesting the consumption of different groups of cereals based on their photosynthesis pathways. Variation in dental health (the frequency of caries and calculus) may also elucidate differences in the composition of the diet of different groups. Some studies for instance suggest that men may have eaten more fish than women and had a diet that stimulated lesions, which possibly indicates a greater consumption of wine (Bourbou, forthcoming; Prowse, 2011). It remains difficult to assess as to what extent the patterns observable in one set of individuals may be generalized into wider conclusions regarding diet and nutrition in the Roman world (cf. Scheidel, 2012; 330). It is clear, however, that conclusions regarding nutrition in the ancient world cannot be made on the level of 'the Roman Empire', but need to take into account gender and age, and the role of geography, social and economic structures, settlement type, political status and cultural background. Hence, scholars should be careful not to generalize conclusions drawn on the basis of specific case studies.

This is not to argue that malnutrition did not affect significant segments of Roman society, but it is to warn against the *a priori* assumption that nutritional deficiency was the constant and inevitable fate of all but a happy few. Chronic deficiency must moreover be distinguished from temporary food shortages, and the latter were undoubtedly common in the Roman world. But once again, nuance and differentiation are necessary. The inhabitants of the political centres of the Roman world were shielded from famine by state interference most of the time (Erdkamp, 2005, 2015). It is often claimed that the logistical challenge of feeding large cities imposed a cereal dominated diet on their inhabitants, resulting in a one-sided and hence inadequate diet. On the one hand, cereals seem to have had a primary role in the urban food supply, as almost all measures regulating the food market in classical Athens and the Roman world are limited to cereals and bread. Furthermore, our written sources pay far more attention to the grain harvest and grain prices than any other foodstuff, while the distribution of subsidized or free food in the city of Rome was for three centuries limited to wheat (cf. Erdkamp, 2013). On the other hand, this should not rule out a significant consumption of other foodstuffs. While providing sufficient amounts of perishable items out of season, such as fresh vegetables and fruits, in the case of the metropolis Rome may indeed not have been possible, we believe the view of a diet overly dominated by cereals to be too grim, if only because wine, olive oil, garum and pulses were not logistically unattractive (cf. Corbier, 1999 on pulses). We will argue that especially the latter category is underrepresented in most modern models. In contrast to urban dwellers, rural populations in more isolated inland areas were subjected to the vagaries