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## **Reading the dental record : a dental anthropological approach to foodways, health and disease, and crafting in the pre-Columbian Caribbean**

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### **Citation**

Mickleburgh, H. L. (2013, September 26). *Reading the dental record : a dental anthropological approach to foodways, health and disease, and crafting in the pre-Columbian Caribbean*. Retrieved from <https://hdl.handle.net/1887/21791>

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**Note:** To cite this publication please use the final published version (if applicable).

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**Issue Date:** 2013-09-26

## CHAPTER 8 TEETH TELL TALES

### 8.1 INTRODUCTION

This study focussed on traces of daily lifeways left on the human dentition, i.e., patterns of dental wear and pathology, and temporal and spatial variation therein in the pre-Columbian Caribbean archipelago. The central question guiding this research was aimed at investigating how evidence from human dentitions contributes to knowledge of the lifeways and cultural practices of the pre-Columbian Amerindians of the insular Caribbean. In answering this central research question, the study was divided into three key aspects of lifeways and cultural practices: foodways, health and disease, and certain (gender-related) craft activities. As stated at the outset this study was designed to integrate information from dental wear and pathology into current knowledge from studies of palaeodiet, palaeopathology, and craft production in the region. The multi-disciplinary approach, which combines archaeological, bioarchaeological, ethnohistoric, and ethnographic data, as well as evidence from clinical dentistry has enabled a more sophisticated understanding of the dental anthropological data produced in this study. Below, the conclusions of this research are presented following the three main sub-questions (sections 8.2, 8.3, and 8.4) and the main research question (section 8.6) that were outlined in Chapter 1. Section 8.5 deals with the unique case of Intentional Dental Modification at the site of Chorro de Maíta (Cuba), and illustrates how dental anthropological data can be used in the reconstruction of individual life histories. Future directions of research are discussed in section 8.7.

### 8.2 FOODWAYS

As a key aspect of lifeways and cultural practices, foodways formed an important feature of this study. The investigation concentrated on what dental wear and pathology reveal about foodways in the pre-Columbian Caribbean region. The focus was laid on temporal and spatial patterns in wear and pathology, and how these may be related to sociocultural, sociopolitical, and environmental developments in the region.

One of the most notable outcomes of this investigation into foodways is the degree of variation observed between the different sites. While this study shows that the great majority of those sites would have comprised communities with mixed-economy subsistence practices, who relied heavily on agricultural/horticultural produce, nonetheless it is clear from the results that foodways in each community varied according to the local environment and sociocultural identity. Throughout the region, foodways changed over time. These broad scale changes mirror broad scale developments, such as climate change, population growth, and/or increasing social complexity.

### 8.2.1 Community foodways

Although most sites show a (very) large agricultural/horticultural component in the diet, particularly in the Late Ceramic Age (A.D. 600/800–1500), based on the differences found here between the sites it seems that the communities at each individual settlement adapted to their own particular surroundings and needs. This supports earlier findings which indicate the distinctive adaptability of each community to their particular surroundings (Newsom and Wing 2004). Undoubtedly, this would have for a large part been affected by the local environment and ecology. In the Caribbean this could potentially be related particularly to the proximity to marine resources, which can heavily influence dental wear and pathology. However, with the exception of Escape (St. Vincent) and perhaps Canashito (Aruba), none of the sites in this study show evidence of a predominantly marine or terrestrial protein oriented diet. At all other sites foodways are characterized by a mixed food economy, with substantial amounts of refined staple plant foods. The greatest differences observed between the sites in this study regard the proportion of consumed starchy and sugary carbohydrates. For the region as a whole, the agricultural/horticultural portion of the diet can be considered significant even at sites that are clearly ideally situated to exploit marine resources. At some sites, this heavy focus on the agricultural/horticultural component of the diet is surprising considering previous carbon and nitrogen stable isotope studies, the site setting, and the amount and diversity of (marine) faunal remains recovered. For example, at Anse à la Gourde (Guadeloupe), the location of the site, isotopic studies, and marine fauna remains indicate that the inhabitants likely consumed a heavily protein oriented diet. Yet the results from this study indicate that Anse à la Gourde must have been one of the most agriculturally/horticulturally oriented communities in the dataset, with its inhabitants consuming very large proportions of cariogenic plant foods, mostly processed starches.

### 8.2.2 Social differentiation and foodways

Differences were found between male and female foodways at a few of the sites, and for the overall sample. Where differences were found, they are relatively subtle, and imply very slight differences in proportions of carbohydrates and proteins, and slight differences in the abrasivity of foods. It is possible that men ate slightly more protein, probably marine foods which were more abrasive to the teeth. Females would have eaten slightly more refined carbohydrates, probably soft, sticky, boiled staple foods, and perhaps more fruit, and they may have eaten more frequently during the day than males. The subtlety of the differences found between the sexes is interesting, particularly in the light of other studies worldwide, where differences between the sexes are often relatively large, reflecting sexual division of labour, task activities, or gender-based status differentiation. Although the effects of biological differences (particularly regarding pathology) between men and women cannot be discounted, considering the differences in degree of wear and severity of other types of mastication damage to the teeth (posterior chipping),

it is deemed more likely here that the dentitions truly reflect small differences in foodways. These differences may very well be related to daily task activities, such as staple food preparation by females, as well as different preferences for preparation of foods and more frequent food consumption by females. The limited differences observed between male and female foodways suggest that no major sex-based status differentiation was expressed through access to and consumption of food.

No other evidence was found for status differentiation in foodways in this study. While it is possible that differentiation in food consumption was practiced in ritual and ceremonial activities, as suggested in previous studies in the region (Curet and Pestle 2010; Mickleburgh and Pagán Jiménez 2012), and there is some evidence for slight differences between the sexes as explained above, no indications were found for the expression of status differentiation in daily (staple) food consumption throughout the Ceramic Age occupation of the region.

Children in the Ceramic Age Caribbean started eating solid foods from the age of 1–2 years onward. According to stable isotopic analyses children would have been weaned completely from breast milk around the age of 2.5–4 years. From this age onward, the effects of carbohydrate consumption (particularly starches and sugars) are apparent in juvenile dentitions, showing that at this age children were (regularly) fed cariogenic plant foods. As such, it appears that the transition from a breast milk dependant infant to a young child consuming solid foods would have been relatively gradual. Weaning diets are known to sometimes differ substantially from adult diets, often including more refined, boiled and sweet or sweetened foods, which may continue to comprise the juvenile diet for a number of years (Lewis 2007).

### 8.2.3 Changing foodways

Significant temporal differences in foodways in the pre-Columbian Caribbean were observed. At individual sites, temporal differences were either absent, or not great enough to significantly impact the dentitions. Only at the site of Tutu (St. Thomas) were significant differences apparent between the early and late occupation phases of the settlement. However, this site may have been abandoned for around 200 years between the two phases, suggesting that customary foodways may have been broken with for very specific sociocultural reasons. On a broader, regional scale there is a significant shift toward more refined (i.e., more heavily processed), agriculturally oriented foodways in the Late Ceramic Age. Since the dental anthropological data reflect both changes in food types and food preparation techniques, it is likely that an important factor in this significant change was the refinement of food preparation techniques over time. As broad scale carbon and nitrogen studies of larger populations pertaining to both main Ceramic phases of occupation of the region are yet to be done, currently no comparative data on proportions of carbohydrate and protein consumption are available. Nonetheless, since the shift toward refined, processed plant food consumption observed in the Late Ceramic Age group in this study is very substantial, it is unlikely to be the

result of changing food preparation techniques alone, and as such reflects a true shift in diet composition in the region over time.

This study supports the findings of earlier research, that the Late Ceramic Age brought a distinct increase and intensification of agricultural practices in the Greater Antilles. Moreover, the results of this study indicate that there was a shift of equal, if not greater, magnitude in the Lesser Antilles during the Late Ceramic Age. In a region that has been assumed not to have developed the type of intensified agriculture traditionally associated with Late Ceramic Age chiefdom societies of the Greater Antilles, evidence from the dentitions of its inhabitants demonstrates that highly refined starchy and sugary plant foods comprised a major part of the diet.

The reasons for this shift in foodways are unclear. In the Greater Antilles intensified agriculture has been associated with the rise of chiefdom societies in the Late Ceramic Age. But the similar shift in foodways in the Lesser Antilles, where this kind of social complexity did not develop, indicates that the relation between sociopolitical organization and foodways in the Caribbean is not straightforward. It is possible that the shift is related to climatic changes. Perhaps the overexploitation and resulting depletion of various resources, coupled with a lengthy dry period after the Early Ceramic Age (400 B.C. – A.D. 600/800) prompted communities to adapt their subsistence economies and attempt to find solutions for unpredictable and decreasing resources by bringing the food economy more directly under human control, i.e., through increased and intensified agriculture, which could potentially offer a more reliable and steady supply of food. Also, the increased precipitation after the dry period may have been conducive to agricultural/horticultural practices. Whatever the reasons for this change in foodways over time, subsistence practices throughout the region in the Late Ceramic Age were able to support growing populations, with the number and size of sites increasing significantly during this period.

### 8.3 HEALTH AND DISEASE

The research focussed on what dental pathology reveals about oral and general health and disease patterns in the pre-Columbian Caribbean over time, and how this compares to other lines of evidence on past health in the region.

Oral health and hygiene in the pre-Columbian Caribbean was generally poor. In all larger assemblages studied here, high rates of dental and oral pathology were observed in the majority of the adult population and in a substantial portion of the juvenile population. Although the sparse ethnohistoric accounts indicate that oral health and hygiene practices were upheld by some Amerindian populations, the results of this study show that oral hygiene must have been very poor or lacking entirely. Most individuals suffered from carious lesions and associated inflammation, and most adults would have suffered from inflammation of the gums and periodontal ligaments, ante mortem tooth loss, and sometimes from abscesses.

Women generally suffered higher rates of dental disease than men. Most observed differences between male and female dental health and disease are the result of slightly differing foodways between the sexes, as described above, although it cannot be ruled out that biological and hormonal differences between the sexes played a role (Lukacs and Largaespada 2006).

### 8.3.1 Community health and disease

The dental pathology observed at the various sites is for a large part the result of differing foodways. Nonetheless, the observed variation indicates that pre-Columbian communities in the Caribbean archipelago were affected differently by dental diseases and the associated problems with general health and physiology. The rate of dental defects associated with non-specific physiological or metabolic disorders also differs per community, probably indicating that physiological stress typically associated with population growth and increased density was more prevalent in some communities than others due to local (environmental) conditions. No patterns were observed in the spatial or temporal distribution of the degree of dental pathology and defects, i.e., the pathology load, again suggesting that individual local communities each adapted to their specific environment in their own way.

### 8.3.2 Changing health and disease

There were notable changes in oral health and disease patterns in the pre-Columbian Caribbean region over time in the Ceramic Age (400 B.C. – A.D. 1500). For a large part, these changes are associated with the changes in foodways described above. Deterioration of oral health conditions as a result of changing foodways would have impacted the general health and physiology and burdened the immune system, leading to pain, inflammation and restricted ability to masticate and consume food.

Dental defects such as linear enamel hypoplasia increased over time. Such dental defects have been documented globally in prehistoric societies and increases in their prevalence are associated with population growth and greater population density (Larsen 1995; Larsen and Walker 2010). The observed increase in dental defects in the Late Ceramic Age suggests physiological stress due to malnutrition, infectious disease, or other health issues (including weaning stress) was more common in this period. Worldwide, signs of growing physiological stress have been related to increasing population sizes, competition over resources, and crowding (Larsen 1997). This picture concurs with the results of previous studies in the Caribbean that found that the prevalence of infectious disease increased over time (Crespo Torres 2008; Rothschild et al. 2000; Sandford et al. 2002; Sandford et al. 2005).

As has often been demonstrated in other regions of the world, a greater reliance on agricultural/horticultural produce and increasingly refined foods, growing population size and density, and a greater prevalence of infectious disease, along with developmental defects and physiological stress, appear to coincide in the pre-Co-

lumbian Caribbean. This is not to say that population health decreased dramatically over time in the region: as yet there is no evidence for rapid or radical change, such as documented for other regions and periods where for example neolithization and urbanisation played a role.

#### 8.4 CRAFT ACTIVITIES

This part of the research aimed to identify any indications for the use of the teeth as tools in the pre-Columbian Caribbean, and assess whether these could be linked to particular craft activities. Furthermore, key focal points were potential indications for age and/or gender-related divisions in these practices, and evaluating whether ‘non-alimentary activities’ could be elucidated using ethnographic and ethnohistoric information.

General non-alimentary use of the teeth was commonplace throughout the region and over time. Pre-Columbian Caribbean people would have used their teeth on a daily basis to perform a variety of tasks, such as clamping or holding materials in order to keep the hands free for other actions, or the cracking of nuts and shellfish. A substantial portion of the entire sample (13.10%)<sup>10</sup> shows evidence of more specific uses of the teeth, related to craft activities and manufacture of goods. These activities are more strongly associated with males than with females, perhaps indicating gender-based task differentiation in craft activities that involved the use of the teeth. Alternatively, this may be the result of the use of different techniques (i.e., with or without the teeth) by men and women to perform the same or similar crafting activities.

Although it is incredibly difficult to identify the specific activities that caused the types of non-alimentary wear observed in this sample, some indications were found for highly specific task activities, such as basketry, cordage manufacture (e.g., for fish nets), and the use of a bow drill (e.g., to drill stone and shell beads and pendants). These crafting activities would have required a great degree of knowledge, training and expertise.

##### 8.4.1 Teeth as tools

Five types of non-alimentary dental wear were distinguished in this study. Each is related to different types of the use of the teeth as tools, although it is possible that Type 1 is the result of acid erosion as opposed to non-alimentary uses of the dentition. Type 2, the most commonly observed type, is a non-specific type, involving differential wear of the anterior and posterior dentition, which could have resulted from a range of non-alimentary activities. However, within this category, a small number of individuals display a more specific pattern of wear which is interpreted here as the result of the use of the teeth to hold the mouthpiece of a bow drill. Ethnohistoric accounts and previous studies of gender and craft activities from the

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<sup>10</sup> Excluding the six individuals with Type 1 ‘non-alimentary wear’, which could in fact be the result of dental erosion.

region suggest that tasks involving drilling, such as bead manufacture, were performed by men. Although numbers are very small, the results of this study do not entirely support this, since potential bow drill wear was also observed in a female individual. Type 3, which consists of various types of notching and grooving of the anterior teeth, is most likely related to the manufacture of cordage, sewing, or basketry. The number of individuals displaying this type of non-alimentary wear in the sample is small, perhaps indicating that this activity involved some degree of specialized knowledge. Interestingly, in this group there is some tentative evidence of gender-based task differentiation. While the observed grooves and notches show a large degree of variation in size, shape, affected teeth, and orientation, five female individuals (from various sites) show a very distinct pattern of notching of the anterior teeth, which could have resulted from the production and manipulation (spinning and weaving) of (cotton) thread and cordage, or from basketry. Further analysis with SEM is needed in order to understand the precise aetiology of this pattern of wear. Type 4 may represent tentative evidence for the wearing of labrets in the pre-Columbian Caribbean. In one case, this pattern of wear may have been caused by an activity such as the peeling of tubers with the front teeth. Type 5 represents a set of unique patterns of clearly non-alimentary dental wear, probably representing habitual activities that are specific to the individual, since they are not found in any others in the sample.

#### 8.4.2 Caribbean crafting

This study has identified a number of individuals who used their teeth in crafting activities, such as basketry and/or cordage manufacture, and the use of the bow drill, perhaps to fabricate stone or shell beads, and other ornaments. The crafted objects are lacking, however, as is other information on the production process, such as whether crafters were fulltime specialists or whether their craft ‘specialization’ was related to food production. Investigation of the mortuary treatment of the crafts(wo)men found no indications for status differentiation. For these reasons it was beyond the scope of this study to investigate the existence of a specialized craft production system controlled by a politically elite class.

Craft activities using the teeth probably consisted of highly personal, non-standardized crafting technology and techniques, which contrasts with the standardized production process and the passing on of techniques and skills usually associated with craft specialization. The crafts(wo)men identified in this study present a picture of ‘idiosyncratic artisans’, and while it is possible that there was an elite class of specialized crafts(wo)men in the pre-Columbian Caribbean, their craft activities do not appear to have involved the use of the teeth as tools. More research into the craft activities related to non-alimentary dental wear along with analysis of for example other occupational and activity markers on the skeletal frame, such as musculoskeletal stress markers (MSM), is necessary to further elucidate craft practices in the pre-Columbian Caribbean.

The use of the teeth as tools, both for general and specific task activities increased

over time in the region. This difference could indicate a more varied and active daily routine, involving a greater variety of task activities, perhaps associated with the growing communities of the Late Ceramic Age.

#### 8.5 DENTAL ANTHROPOLOGY AND INDIVIDUAL LIFE HISTORIES

Using dental anthropological analyses, it is sometimes possible to reveal aspects of individual persons' lifeways, regarding their biology as well as their social identity and cultural practices. In the case of individual 72B from the site of Chorro de Maíta, Cuba, dental anthropological analysis has uncovered more than just information on her lifeways, but also potentially on grander sociocultural processes in the region at the time of the first colonial encounters with Europeans. The Intentional Dental Modification of her teeth is consistent with Mesoamerican types, particularly those documented for the Postclassic skeletal remains from the site of Lamanai, Belize (Williams and White 2006). This type of dental modification is unique in the pre-Columbian Caribbean islands, and together with other evidence in the form of stable isotope analysis, analysis of cranial modification, and the unusual mortuary treatment of this individual, suggests that she migrated to Cuba from the Mesoamerican mainland. Considering the site context, it is possible that she was brought to Cuba through European slave transport in the early colonial period (Valcárcel Rojas 2012). The mortuary evidence suggests that individual 72B was not alone in migrating to Cuba: those who buried her knew the mortuary customs of her area of origin, and treated her in the appropriate manner in death. This case demonstrates the value of a multi-disciplinary approach, in this case combining dental anthropological research, other osteoarchaeological work, and evidence from mortuary practices.

#### 8.6 LIFEWAYS AND CULTURAL PRACTICES IN THE PRE-COLUMBIAN CARIBBEAN

The main aim of this research was to investigate how evidence from human dentitions contributes to knowledge of the lifeways and cultural practices of the pre-Columbian Amerindians of the Caribbean archipelago.

Evidence from human dentitions has revealed hitherto unexplored aspects of lifeways and cultural practices in the pre-Columbian Caribbean. Individuals, communities, and regional populations in the Caribbean were physically affected by their foodways and cultural practices, leaving permanent traces on their teeth. Differences were observed between sites, indicating that foodways varied per community, likely due to local environmental conditions and sociocultural preferences. Nonetheless, the dental evidence indicates that most communities represented in this study consumed large amounts of cariogenic plant foods, with the exception of the individuals at the sites of Canashito (Aruba) and Escape (St. Vincent), showing that agricultural/horticultural practices formed an important aspect of daily lifeways for most Ceramic Age Caribbean Amerindians. Sex-based labour division,

perhaps related to these agricultural/horticultural practices and food preparation, may have resulted in slightly differing foodways between males and females. These slightly varying foodways also differentially affected the health of both sexes, with females more severely and frequently affected by dental disease associated with carbohydrate consumption. Despite these small differences, no evidence for status differentiation in foodways was found in this study. Furthermore, children appear to have consumed the same or a very similar diet to adults after weaning. As such, it appears that status differentiation was not expressed in daily foodways, although restricted access to certain foods may have existed in ritual or ceremonial contexts. Communities adapted their foodways over time, increasingly focusing on the production of more refined, processed plant foods, and consuming larger proportions of agricultural/horticultural produce. This resulted in drastically contrasting dental wear and pathology profiles between the Early Ceramic Age (400 B.C. – A.D. 600/800) and the Late Ceramic Age (A.D. 600/800–1500), which coincide with broad scale social and environmental changes during the transition between these two periods. While it is possible that the changes in foodways over time observed are related to increasing social complexity, population growth, and/or changing precipitation levels, caution must be applied in drawing direct causal relationships between them.

The changes in foodways over time were paired with changes in oral and general health. For the greater part, these changes are related to the increase in the consumption of processed carbohydrates, but are likely also symptomatic of population growth and increasing population density. Although overall there is an increase in dental disease over time, differences were observed between the individual sites, again suggesting that local conditions and sociocultural choices influenced health. Large numbers of individuals were affected by a pattern of wear known as LSAMAT. This study has shown that patterns of lingual wear currently identified as LSAMAT need further investigation, since various activities may be associated with the loss of lingual surface enamel of the upper front teeth. It is likely that a considerable portion of the individuals with LSAMAT consumed acidic foods, or suffered from gastric acid regurgitation, causing loss of lingual enamel in the upper anterior dentition (Type 1 LSAMAT). Type 2 LSAMAT corresponds more clearly with the action of pulling some form of fibrous (plant) material across the tooth surfaces, either for alimentary or non-alimentary reasons.

A range of task and craft activities were performed with the teeth. Pre-Columbian Caribbean Amerindians frequently used their teeth in general task activities (such as clamping objects), likely on a daily basis, showing that the mouth and dentition formed an integral part of embodied practice. Specific craft activities using the teeth were performed by a smaller portion of the population, and were associated more strongly with males than females. These craft activities included the fabrication of cordage, basketry, and perhaps the oral use of bow drills. No evidence for standardized production, often associated with craft specialization, was found. It seems that these craft activities involved highly personal, non-standardized craft-

ing technology and techniques; the Amerindian crafts(women) could be characterized as 'idiosyncratic artisans', each adopting their own body techniques in the crafting process. The increase in the use of the teeth as tools over time could perhaps be related to the growing communities of the Late Ceramic Age, possibly involving a greater variety of task activities.

Finally, on an individual level dental anthropological analysis has uncovered information on the life history of a young female buried at the site of Chorro de Maíta (Cuba), which in turn has revealed grander sociocultural processes in the region at the time of the first colonial encounters with Europeans.

### 8.7 FUTURE DIRECTIONS

The temporal changes in foodways throughout the Caribbean islands revealed through analysis of dental wear and pathology could be considered the most significant outcome of this study. Yet an important part of the pre-Columbian era in the insular Caribbean was not represented: the Lithic and Archaic Age. In part this is due to the general sparseness of recovered human skeletal material belonging to this period. Some preceramic skeletal material exists, however, and comparison of the dental wear and pathology with the results of this study will undoubtedly enrich our understanding of pre-Columbian Caribbean foodways, health and disease, and crafting. Similarly, the Early Ceramic Age period population of the Greater Antilles was sorely underrepresented in this study, due to the lack of available dental material. In the light of the great differences observed between the Early and Late Ceramic Age in the Lesser Antilles, Early Ceramic Age dental material from the Greater Antilles warrants equal attention.

Smaller scale intra-site temporal differences in foodways proved more difficult to trace. In part this is due to the relatively small sample sizes of human skeletal remains belonging to each occupation phase. At some sites, such as Manzanilla (Trinidad), and Anse à la Gourde (Guadeloupe) larger scale or complete radiocarbon dating of the human skeletal remains may produce sufficiently large samples per occupation period to allow comparisons to potentially track changes or continuity in foodways over time, inviting future work on this subject.

This study has demonstrated that dental anthropological data can reveal craft activities performed by individual humans in the pre-Columbian Caribbean. To further explore craft activities in this region the combined analysis of various occupational and activity markers on the skeletal frame, such as musculoskeletal stress markers (MSM) is needed. The bioarchaeological study of crafting sheds a unique light on these activities, since it centres on the crafts(women), as opposed to the (finished) craft product.

This study has also shown the potential of studying juvenile dental wear in order to understand weaning practices in the past. More detailed investigation into juvenile patterns of dental wear can provide a more sophisticated understanding of the duration of weaning. Currently, due to the fact that bone collagen has a relatively slow

turnover rate there is a significant lag in the expression of the individual's trophic level in his/her bone collagen, meaning that the age at which the weaning process starts can be hard to estimate. The combined use of juvenile dental wear studies and oxygen and carbon and nitrogen stable isotope analysis can contribute significantly to this issue. It is posited here that juvenile dental wear must be assessed in a similar fashion to adult dental wear: i.e., it must be graded per dental element for loss of crown height, direction of surface wear, and occlusal surface shape (see for example Clement and Freyne 2012).

Finally, without the multi-disciplinary approach used in this study, it would not have been possible to answer the main research questions posed in Chapter 1. Dental anthropological analyses alone could not have provided the necessary sociocultural context within which the results of this research ought to be interpreted. Future dental anthropological work in the region, therefore, must similarly be part of an integrated, multi-disciplinary research design – perhaps including lines of research not explored here – which dissolves disciplinary boundaries in order to understand the Caribbean past.

