NON-SPECIFIC STRESS INDICATORS AS POSSIBLE EVIDENCE FOR GENDER DIFFERENCES IN ACCESS TO HEALTH CARE IN COLONIAL AND POST-COLONIAL AMERICA

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INTRODUCTION

- The goal of this study as to test for possible gender inequalities in colonial and post-colonial America.
- Non-specific stress indicators were used to test for differences in nutritional status and healthcare access between children in this era
- The skeletal remains examined came from the Arch Street Cemetery collection which was active during the 18th-19th centuries.
- Gender as a societal construct is fairly new. The distinction between sex and gender was not as clear during the 18th-19th centuries.

HISTORICAL CONTEXT

- Philadelphia was a booming commercial hub during its formative years, however in the 1720s the city saw a halt in trade which resulted in a tremendous increase in unemployment levels.
- Children were expected to work through childhood, frequently beginning to work at the age of 6 or 7.
- In many cases women and children were left out of the tax records and any historical documents that had to do with work, the inclusion of these minority groups in the historical record could possibly point to even more inequalities in the workforce.

HISTORICAL CONTEXT CONT.

- Diseases and death in children were often attributed to the divine, it was not until the end of the 1700s that a new school of thought was emerging that looked at these cases as scientific.
- The increase in migrants to the city of Philadelphia meant that there was an influx in new diseases and illnesses.
- It was common for children to be subject to malnutrition or disease from various fronts of colonial life:
  - "[…] extremes of heat and cold; insects; impure milk; polluted drinking water; famine; ignorance of diet and sanitation; accidents; malnutritional diseases; epidemics; putrid fevers; influenza; "bladders in the windpipes" (diphtheria) […]" (Bloch 1974)

WHAT ARE NON-SPECIFIC STRESS INDICATORS?

- Non-specific stress indicators in human osteology are physical markers of the body's reaction to stress.
- Stress in this context can be cultural, environmental, or internal factors. Anything that puts the body out of homeostasis can be considered 'stress'.
- Non-specific stress indicators can be caused by various stressors and therefore they cannot be pinpointed to one singular thing. Based on other skeletal information an informed estimate can be made in terms of what caused the non-specific stress marker.
- The non-specific stress indicators examined in this study include Linear Enamel Hypoplasias, Cribra Orbitalia, and Porotic Hyperostosis.

LINEAR ENAMEL HYPOPLASIAS

- These markers are characterized by indentations or rings of thinner enamel on the teeth.
- They indicate periods of physiological stress during childhood.
- The growth and development of enamel occurs during critical developmental years which is what makes them useful in estimating physiological stressors.
- LEHs that are in approximately the same spot on each tooth can indicate a specific period of stress– examples can include periods of extreme poverty in which a child did not have access to proper nutrition

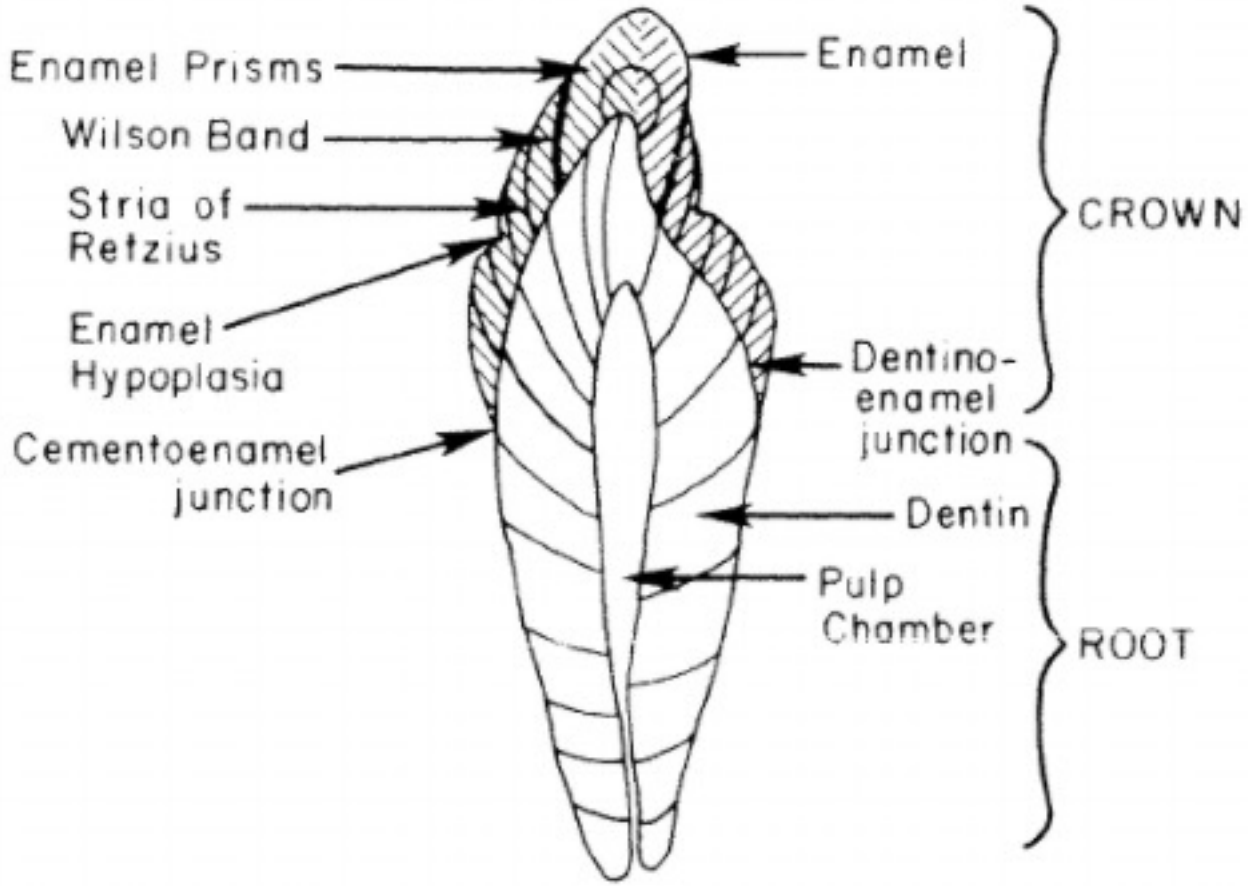

Fig. 1 Diagrammatic representation of a longitudinal section through a human mandibular canine. Note the major structures of enamel: enamel prisms and striae of Retzius (from Rose et al., 1985:283).

Figure 1: Goodman, A.H. and Rose, J.C. (1990), Assessment of systemic physiological perturbations from dental enamel hypoplasias and associated histological structures. Am. J. Phys. Anthropol., 33: 59-110.

POROTIC HYPEROSTOSIS & CRIBRA ORBITALIA

- Porotic Hyperostosis is characterized as porous lesions grouped together on flat bone.
- Porotic Hyperostosis is most commonly found on the crania.
- Porotic Hyperostosis found within the eye orbits is called Cribra Orbitalia.
- Both Porotic Hyperostosis and Cribra Orbitalia can be indicative of various conditions including pathological conditions. However, the most common assumptions claim that they are the result of anemia or scurvy.

Porotic Hyperostosis

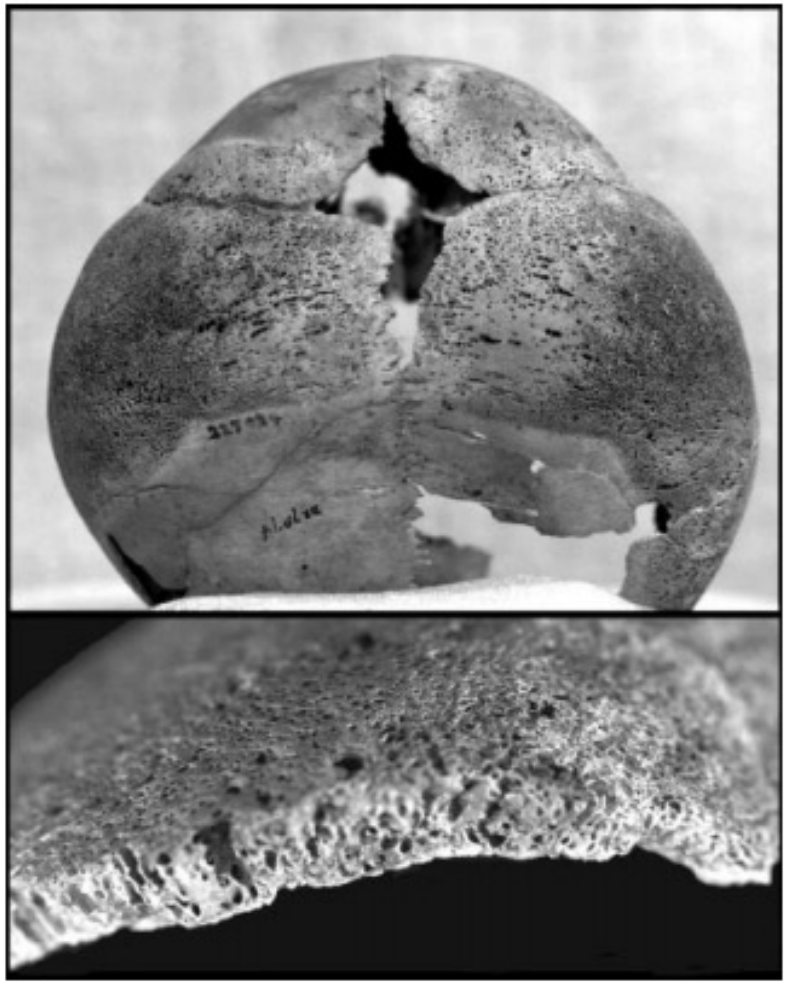

Fig. 1. Porotic hyperostosis. Top: A superior-posterior view of porotic hyperostosis in a 3 year old Native American child from Pueblo Bonito, New Mexico dating from between AD 950–1250 (U.S. National Museum of Natural History specimen 327074). Bottom: Close-up view of a section through the skull of the same individual showing expansion of the diploë and loss of the outer table owing to marrow hypertrophy (Photographs courtesy of Donald Ortner).

Cribra Orbitalia

Fig. 2. Cribra orbitalia. Top: "active" orbital lesions in the skull of a 4-year-old XII Dynasty child from Lisht Egypt. The new bone formation is probably in part a response to subperiosteal bleeding associated with scurvy (U.S. National Museum of Natural History specimen 256571, photo courtesy of Donald Ortner). Bottom: "healed" cribra orbitalia lesions in an unprovenienced anatomical specimen.

Figures 1 and 2: Walker, P., Bathurst, R., Richman, R., Gjerdrum, T., & Andrushko, V. (2009). The causes of porotic hyperostosis and cribra orbitalia: A reappraisal of the iron-deficiency-anemia hypothesis. *American Journal Of Physical Anthropology*, *139*(2), 109-125. doi: 10.1002/ajpa.21031

METHODS

- Twenty-Six skeletal remains were examined from the Arch Street Cemetery remains.
- Skeletons were selected by estimated age (adult vs juvenile), as well as by their level of preservation.
- Sex was estimated using non-metric traits from both the pelvis and the skull.
- Age was estimated using the sternal rib ends, clavicle epiphysial union, pubic symphyses, auricular surface, and when necessary dental eruption.
- Non-Specific Stress Indicators were scored using standard methods of data collection (Buikstra and Ubelaker 1994).
  - Linear Enamel Hypoplasias were only scored on the canines and incisors

STATISTICAL ANALYSIS

- SPSS was used to conduct all statistical analyses.
- Three separate CrossTabulations were run between sex and each non-specific stress indicator.
- Chi Square Tests were run for sex and each non-specific stress indicator
- Fishers Exact Test was used due to the expected cell size falling below 5.

RESULTS

	Sex		Fishers Exact Test (2-sided)
	Male	Female	
Cribra Orbitalia			.653
Present	18.8%	27.3%	
Not Present	81.3%	72.7%	
	Sex		**Fishers Exact Test (2-sided)**
	Male	Female	
Porotic Hyperostosis			.264
Present	27.8%	0.0%	
Not Present	72.2%	100.0%	
	Sex		**Fishers Exact Test (2-sided)**
	Male	Female	
Linear Enamel Hypoplasia			1.000
Present	83.3%	88.9%	
Not Present	16.7%	11.1%	


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DISCUSSION

- Although there were no significant differences found between males and females there are patterns visible that perhaps could persist with a large sample size
- The high prevalence rates of Linear Enamel Hypoplasias in both males and females suggest that there might have been some stressors in childhood that both males and females experienced equally.
  - The high prevalence of LEHs could be connected to the high likelihood of experiencing malnutrition or intestinal diseases throughout childhood.

DISCUSSION

- It is possible that conditions such as Porotic Hyperostosis and Cribra Orbitalia are caused by longer term chronic illnesses (in comparison to the acute conditions that might cause LEHs).
  - The patterns we see with these conditions could indicate differences.
- Porotic Hyperostosis showed an interesting pattern in which 0% of females showed porotic lesions on the crania.
  - This pattern also begs the question of the osteological paradox.

LIMITATIONS OF THIS STUDY

- A primary limitation of this study is the sample size.
  - The small sample size did not allow for a confirmation of the patterns that were seen in the study.
  - A larger sample size could confirm these patterns, or these patterns could completely disappear.

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