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Introduction

The decrease in the oral health of humans has been attributed to the development of agriculture, which greatly increased carbohydrate consumption. Previous studies have found a differential occurrence of oral health between men and women, emerging as early as 12 kya, during the domestication of plants.¹ Archaeological skeletal populations have consistently found a variance in oral health between the sexes, across cultures, and over time. Researchers have attributed the sex differences in oral health to the effects of pregnancies (hormonal changes and nutritional effects) and earlier growth and development in women.^{2,6} Most oral pathological conditions appear in soft tissues. But some (dental caries, tooth loss, periodontal disease) present themselves on the teeth and alveolus and can be identified in the archaeological record.² This project examines a sample of Caucasian men and women grouped in adult age categories to record evidence of dental caries and periodontal disease. The results of this project will be compared to existing literature to determine if these results are concurrent with the trend of women being more predisposed to oral health pathological conditions than men.

Materials & Methods

The human remains examined are a selected sample set from the Robert J. Terry Anatomical Collection, a collection of 1,728 Caucasian and African American males and females ranging from ages 14-102. These people lived and died in the 19th to mid 20th centuries. The study sample was comprised of Caucasian males and females between the ages of 20-87, grouped into three age groups: 20-41 years, 42-60 years, and 61+ years. Individuals who were edentulous were excluded from study since much of the analysis was based on dental health. Teeth for each individual were scored using the DMFT index³ (decayed, missing or filled teeth) and if present, a caries or filling was scored on the degree of variation (Figures 3 & 4) and location⁴. If possible, the exposed root of each tooth was measured with digital sliding calipers from the CEJ (cemento-enamel junction) to the alveolar crest, on both the labial and buccal sides (Figure 1). The greatest distance measured was then subtracted by 2 and was recorded for bone loss. If bone loss measured between 3 and 6 mm, the tooth was recorded as being moderately affected by periodontal disease (Figure 2). If bone loss measured greater than 6 mm, the tooth was recorded as being severely affected by periodontal disease (Figure 2).⁵

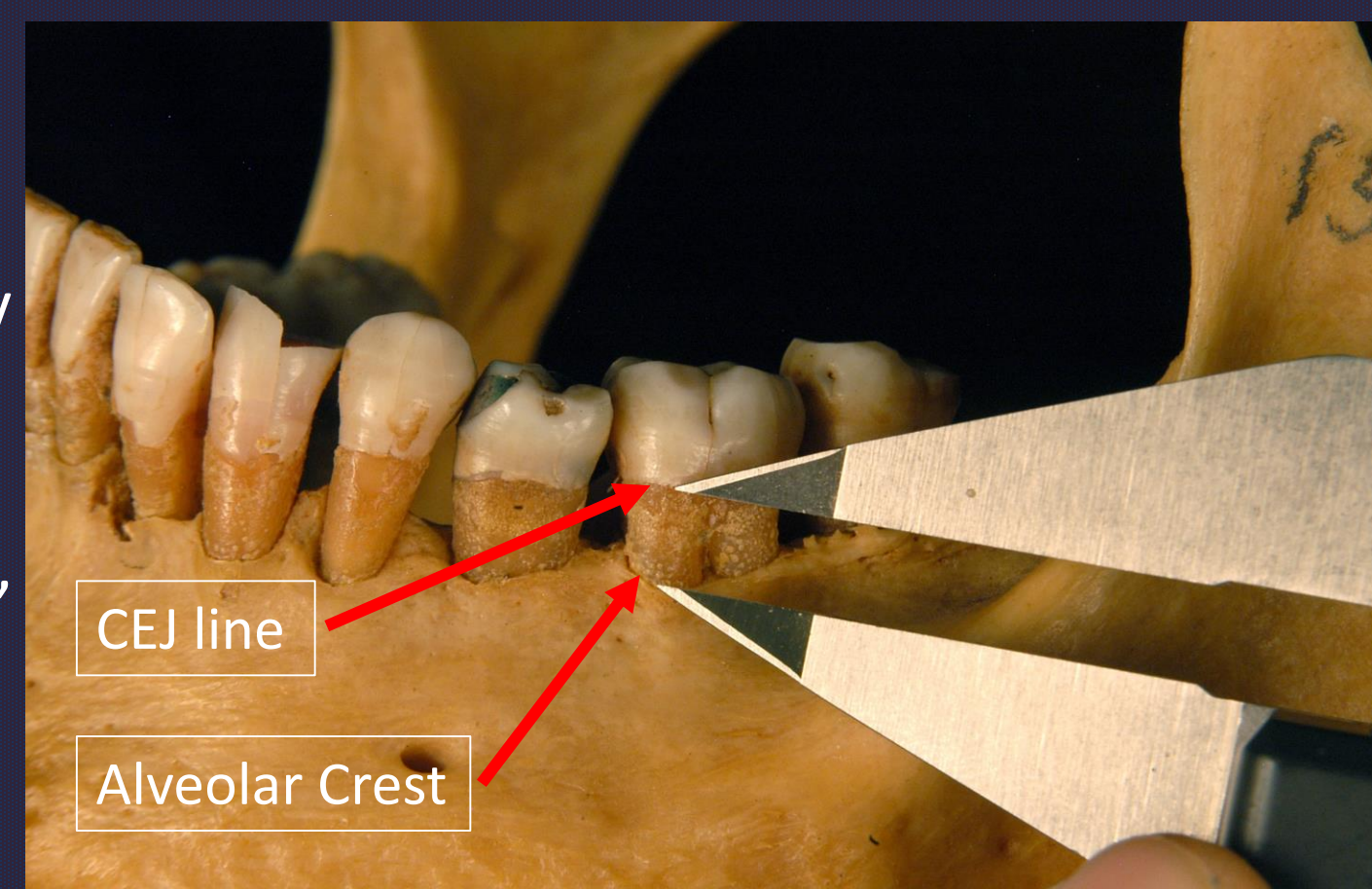


Fig 1. Measurement of the distance from CEJ line to the alveolar crest.

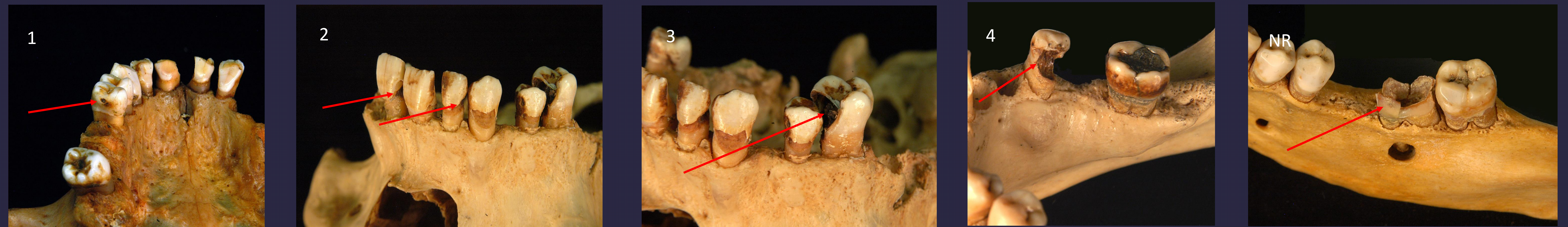
Periodontal Disease

Fig 2. Examples of moderate (left) and severe (right) periodontal disease



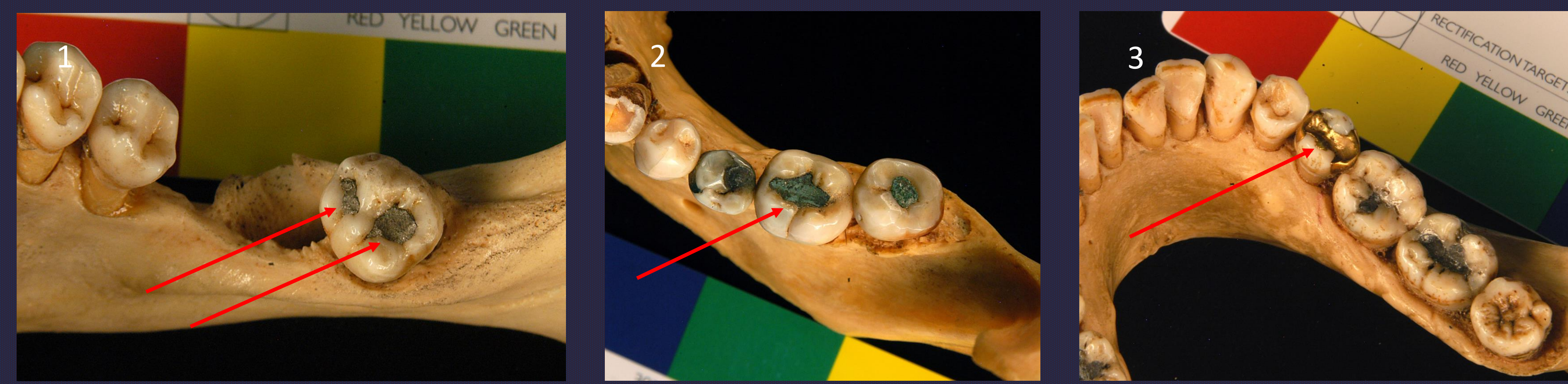
Variation in Caries

Fig 3. Each caries recorded was scored based on the following increase in severity: (1) spotting, (2) pitting- early carious lesion forming, (3) carious lesion observed on less than one half of the tooth, (4) carious lesion observed on more than half of the tooth, (NR) carious lesion observed but tooth too destroyed to determine a surface of origin (non-recordable).



Variation in Fillings

Fig 4. Each filling was scored based on the following increase in coverage: (1) spotting, (2) less than half the tooth is filled, (3) more than half the tooth is filled.



Results

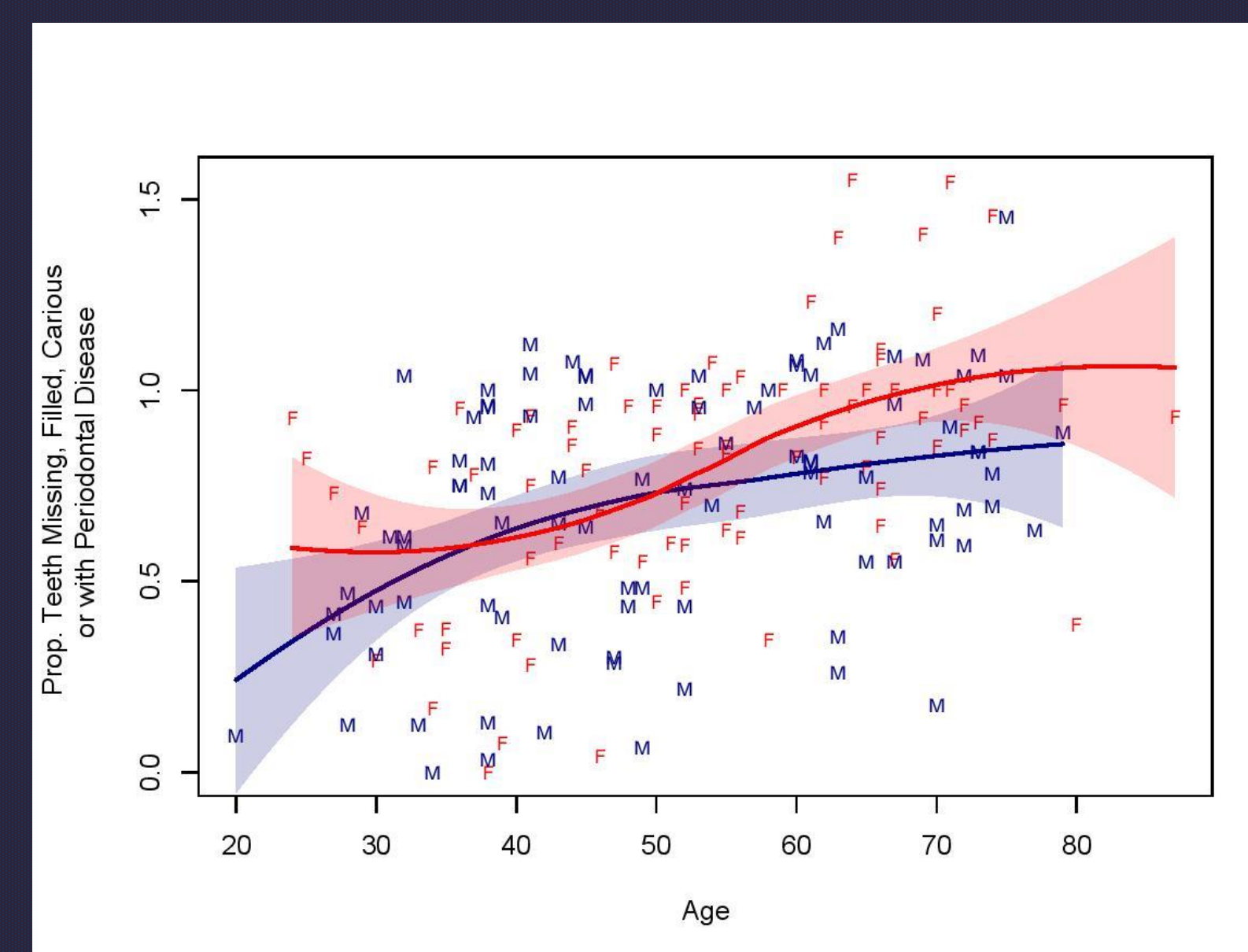


Fig 5. The proportion of all recorded pathological conditions over the total number of teeth presumed to be present at a given time per person by age.

The data reflected an overall decrease in oral health conditions with increasing age. When comparing across sexes, females were recorded with slightly worse oral health during pregnancy years (20-35 y.o.) but there was not enough younger women in the sample to statistically assess this difference. In the 60+ age range, females were recorded to have significantly worse oral health than men (Figure 5). When assessing antemortem tooth loss, women were found to have higher rates of loss than men - but both sexes had increasing overall tooth loss with age (Figure 6). For periodontal disease, both moderate and severe expression were graphed and show that men had higher rates of disease than females (Figure 7). The same trend is shown for caries and fillings - men had a higher recorded rate of caries and fillings than females (Figure 8).

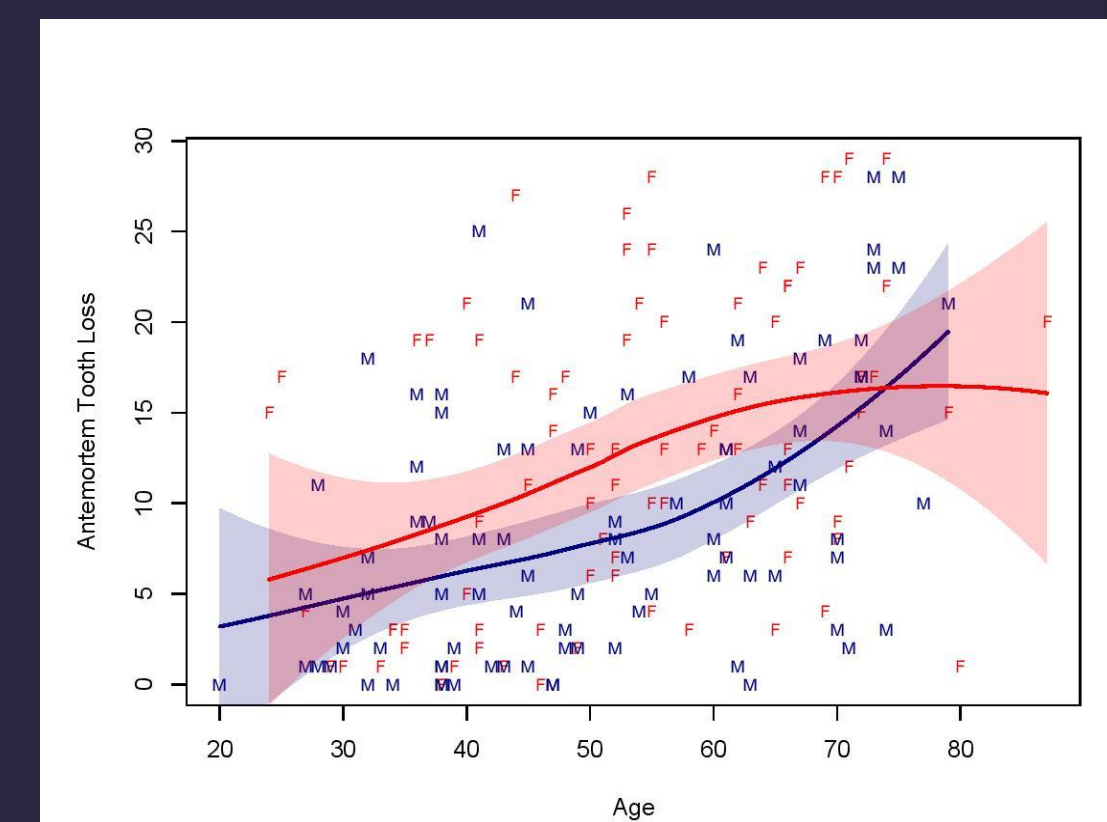


Fig 6. The proportion of total number of antemortem tooth loss over the total number of teeth presumed to be present at a given time per person by age.

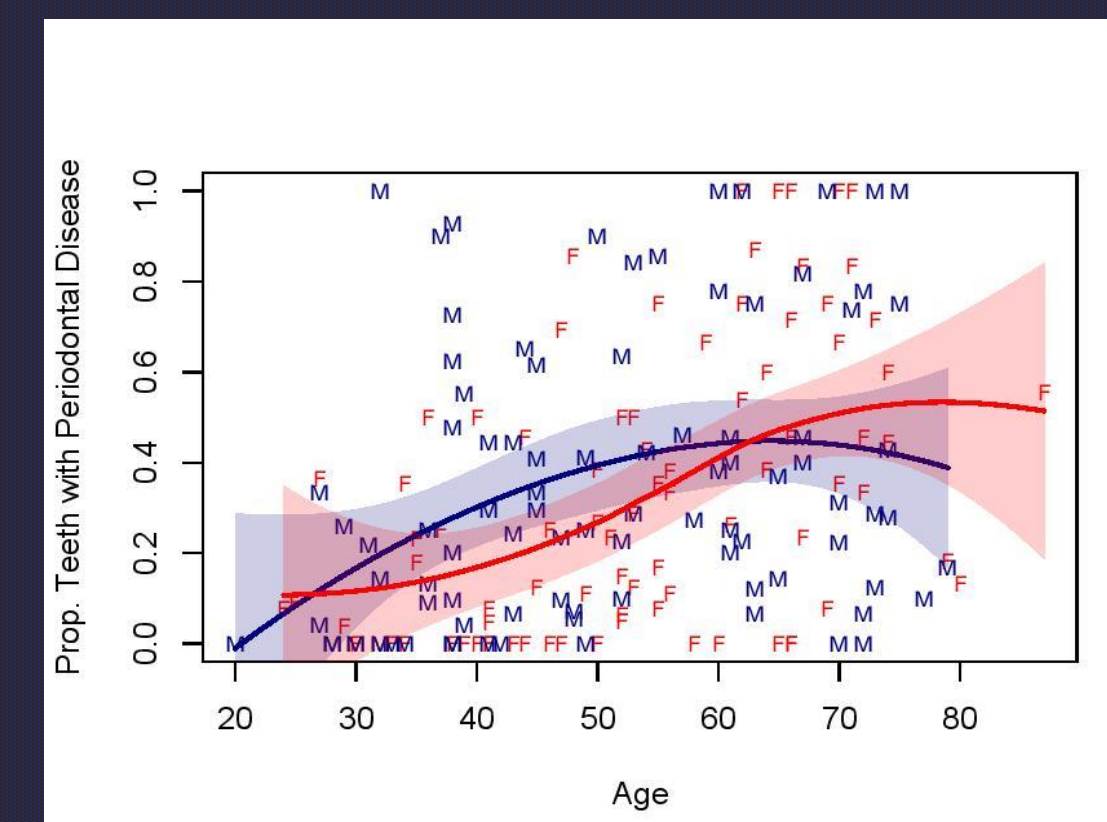


Fig 7. The proportion of total number of teeth with periodontal disease over the total number of teeth presumed to be present at a given time per person by age.

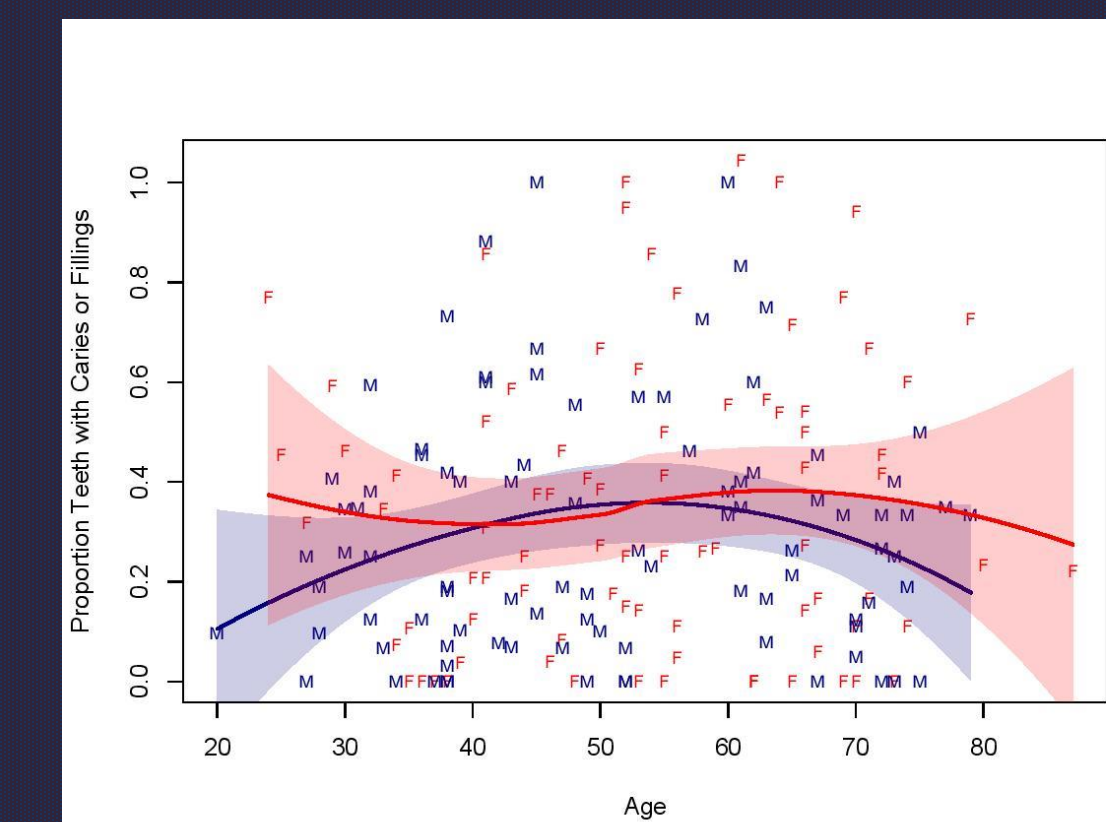


Fig 8. The proportion of total number of teeth with caries or fillings over the total number of teeth presumed to be present at a given time per person by age.

Discussion

Data collecting and the patterns of the results clearly exemplify the complexities that arise in examining oral health. The results of this study do not completely support the hypothesis that women experience higher rates of oral pathological conditions, but the results do elucidate that sociocultural and environmental conditions have a substantial contribution to oral health than just biological conditions alone. This data supports that the gap in oral health that has existed for thousands of years between men and women may be closing, due to higher influences of sociocultural and environmental factors than only biological ones. Recent research suggests that more modern populations of humans, especially in North America, are experiencing less gaps in oral health than observed in past populations.⁶ The present research sheds an additional light on the diversity of health across populations and the constant change populations undergo.

When looking across age groups, oral health conditions worsen steadily with increasing age for both sexes, but do not show a significant difference in overall conditions until approximately age 60. After 60, women are significantly different than men (Figure 5). At the average age range of pregnancies in women (20-35 y.o.) there is a slightly higher rate of pathological conditions observed overall, but the sample size for the women is not large enough to statistically assess this hypothesis (Figure 5).

Further research would involve evaluating populations similar to the ones studied for this project, with the expectation for better understanding the factors that may cause the shift in oral health across sexes. By understanding influences other than biology that affect oral health, we may be able to explain the complexities of pre-historic, historic and modern oral health and discern the differences between sexes and population groups as well as these fluctuations through time.

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References

1. Lukacs, John R. "Sex Differences in Dental Caries Experience: Clinical Evidence, Complex Etiology." SpringerLink, Springer, Dordrecht, 21 July 2010, link.springer.com/article/10.1007/s00784-010-0445-3
2. Larsen, C. Spencer. "Biological Changes in Human Populations with Agriculture." *Annual Review of Anthropology*, vol. 24, no. 1, 1995, pp. 185-213. doi:10.1146/annurev.anthro.24.1.185.
3. Schuller, Annemarie A. and Dorthe Holst. "Oral Status Indicators DMFT and FS-T: Reflections on Index Selection." *European Journal of Oral Sciences*, vol. 9, issue 3, June 2001, pp. 155-159, https://doi.org/10.1034/j.1600-0722.2001.00016.x
4. Bukitra, Jane E. and Douglas H. Ubelaker (eds). *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archeological Survey Research Series No. 44, 1994, pp. 55.
5. Malčić, Ana I., Vodačević, Marin, Matijević, Jurica, Mihelić, Damir, Mehlić, Goranka P. and Silvana J. Kretek. "Caries Prevalence and Periodontal Status in 18th Century Population of Potega, Croatia." *Archives of Oral Biology*, vol. 53, 2001, pp. 1592-1603
6. Russell, Stefanie L., Gordon, Sara, Lukacs, John R., Kaste, Linda M. "Sex/Gender Difference in Tooth Loss and Edentulism." *Dental Clinics of North America*, April 2013 DOI: 10.1016/j.cden.2013.02.006