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Stress Out: How Bioarchaeologists Address Physiological Stress in the Past

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Stressed Out: How Bioarchaeologists Address Physiological Stress in the Past

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Outline

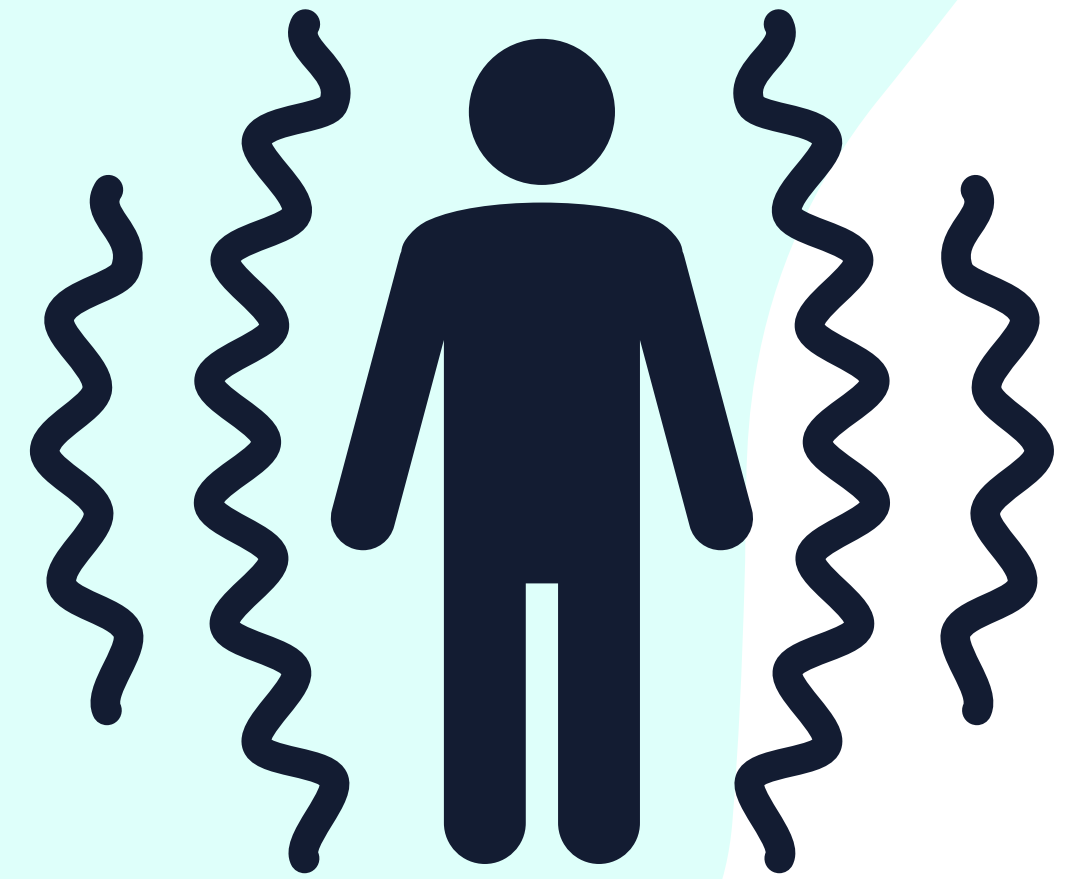
- What is stress?
- Model for Interpretation of Stress Indicators
- Skeletal Indicators of Stress
- Limitations
- Biomolecular Approaches
- Cortisol
- The Embodied Inequality Project



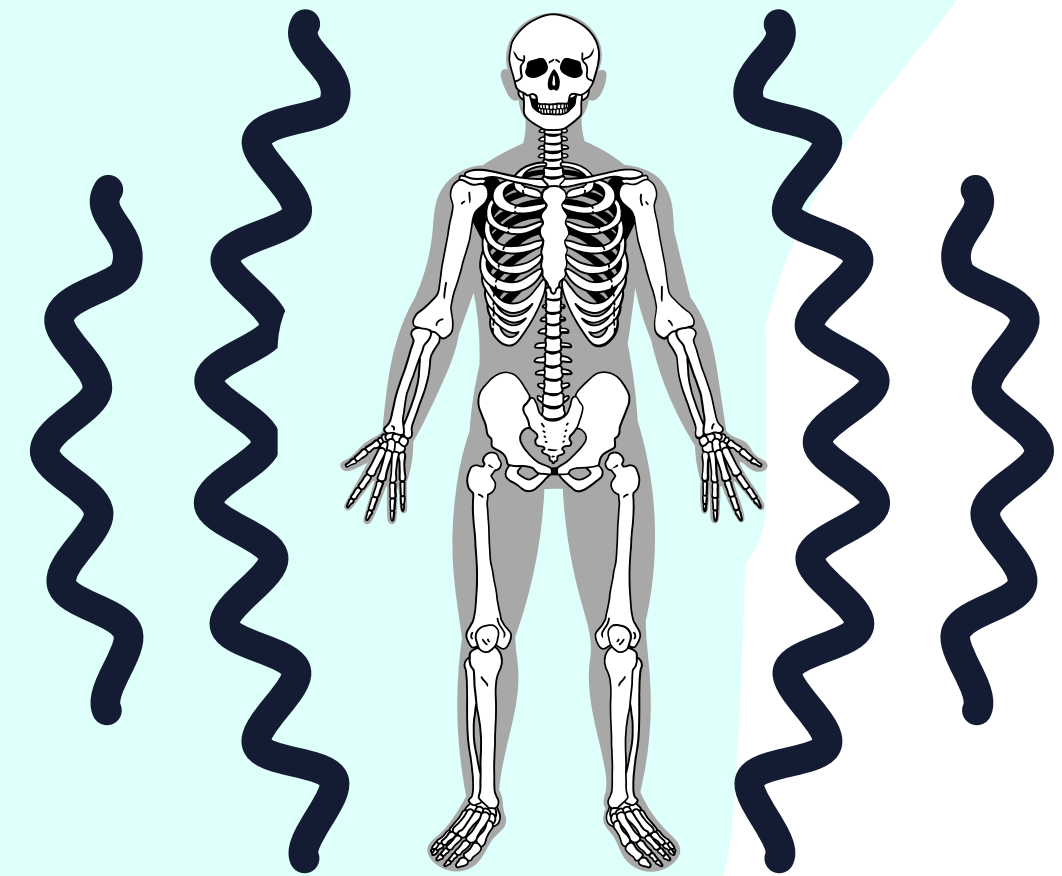
What is stress?



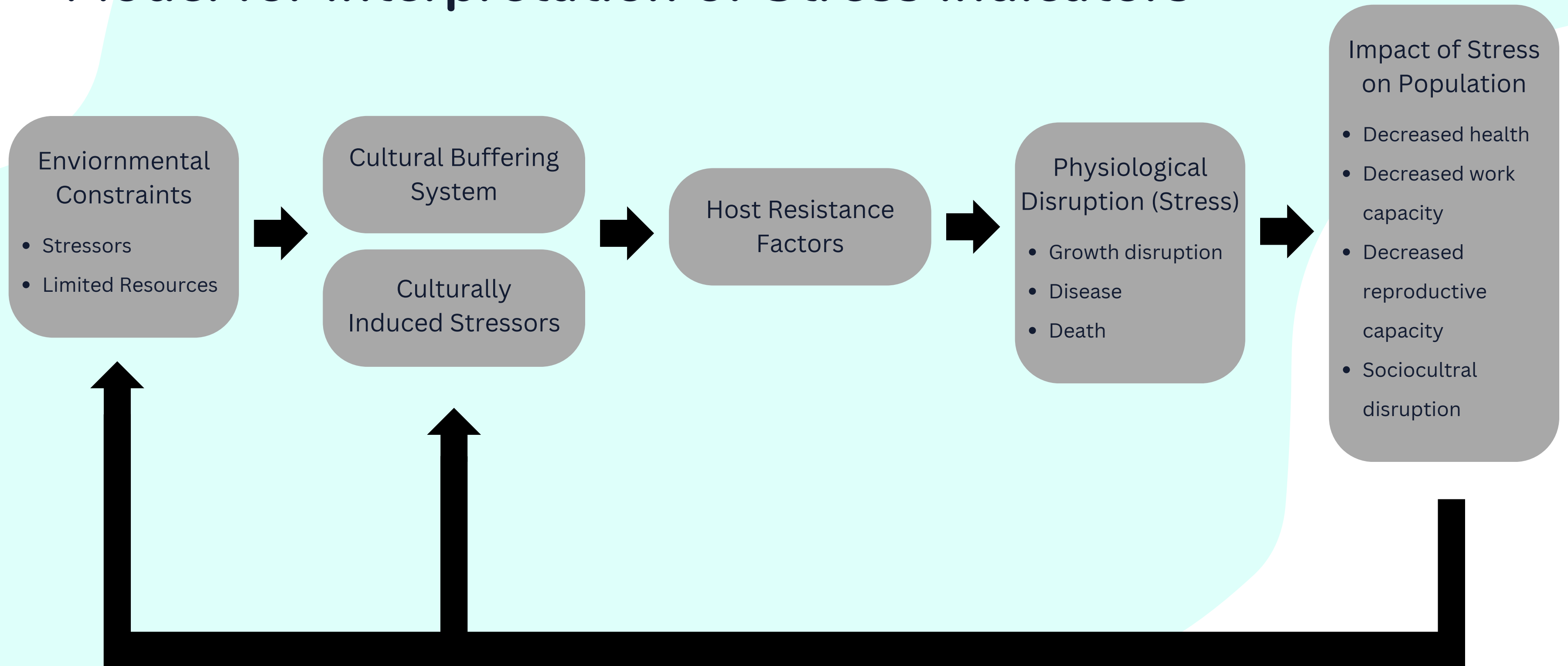
What is stress?



What is stress?



Model for Interpretation of Stress Indicators



Skeletal Indicators of Physiological Stress



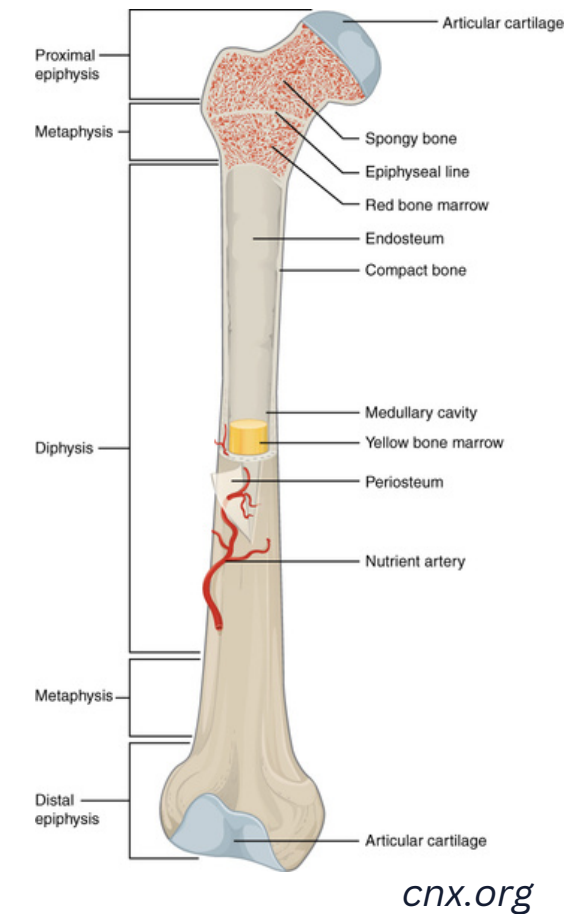
Wasterlain et al., 2020

Enamel Hypoplasia

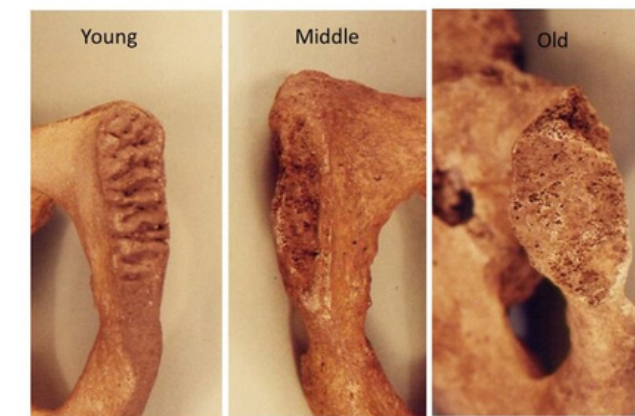


Want et al., 2023

Porotic Lesions



Long Bone Length

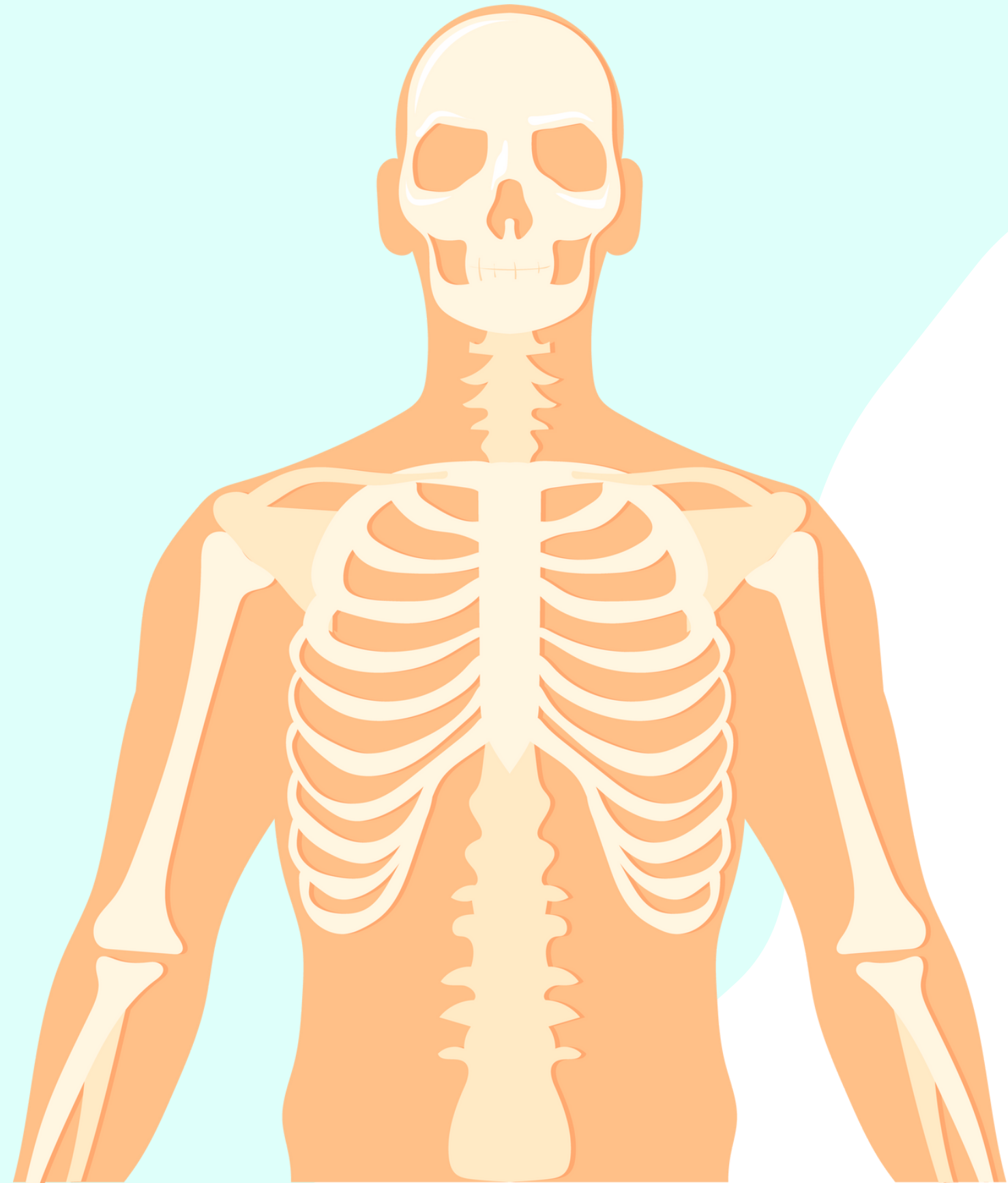


futurelearn.com

Age-at-Death

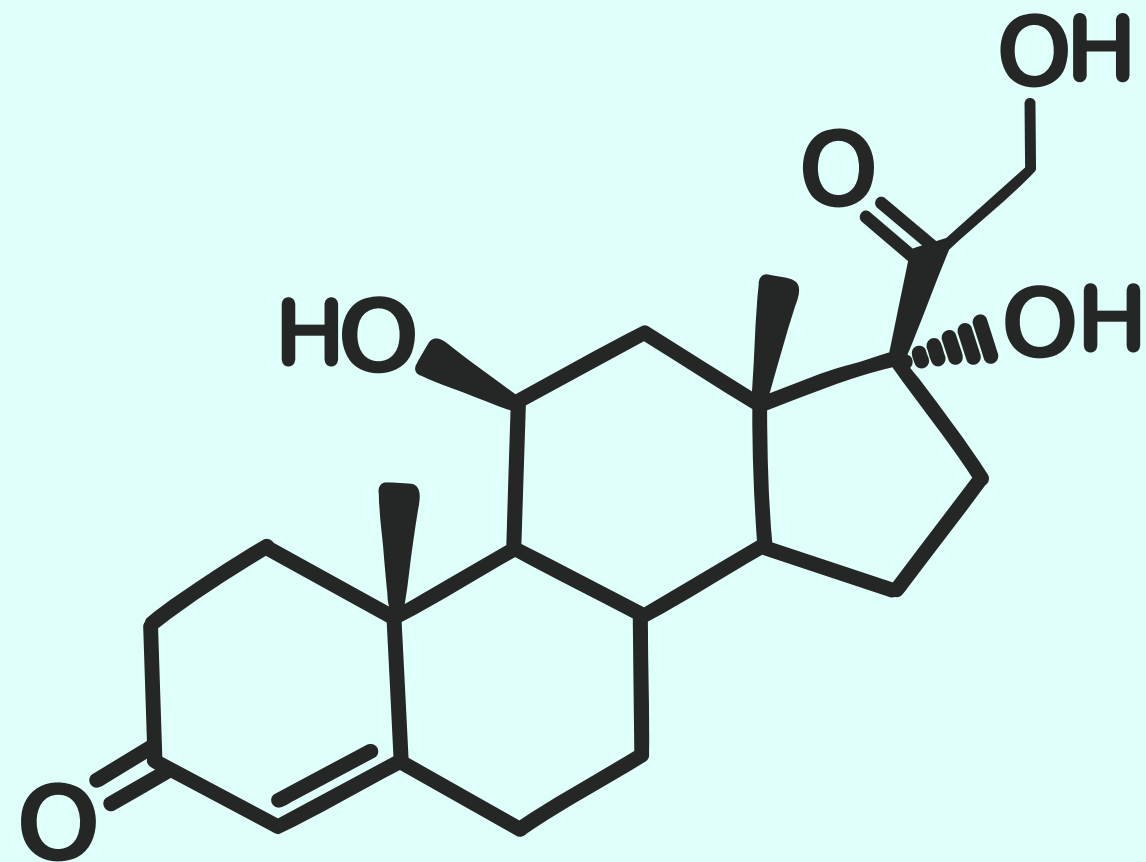
Limitations

- Bone responds in two ways
 - Bone production
 - Bone destruction
- Only chronic diseases present in skeletal remains
- The “Osteological Paradox”
 - Demographic Non-Stationarity
 - Selective Mortality
 - Hidden Heterogeneity in Risks



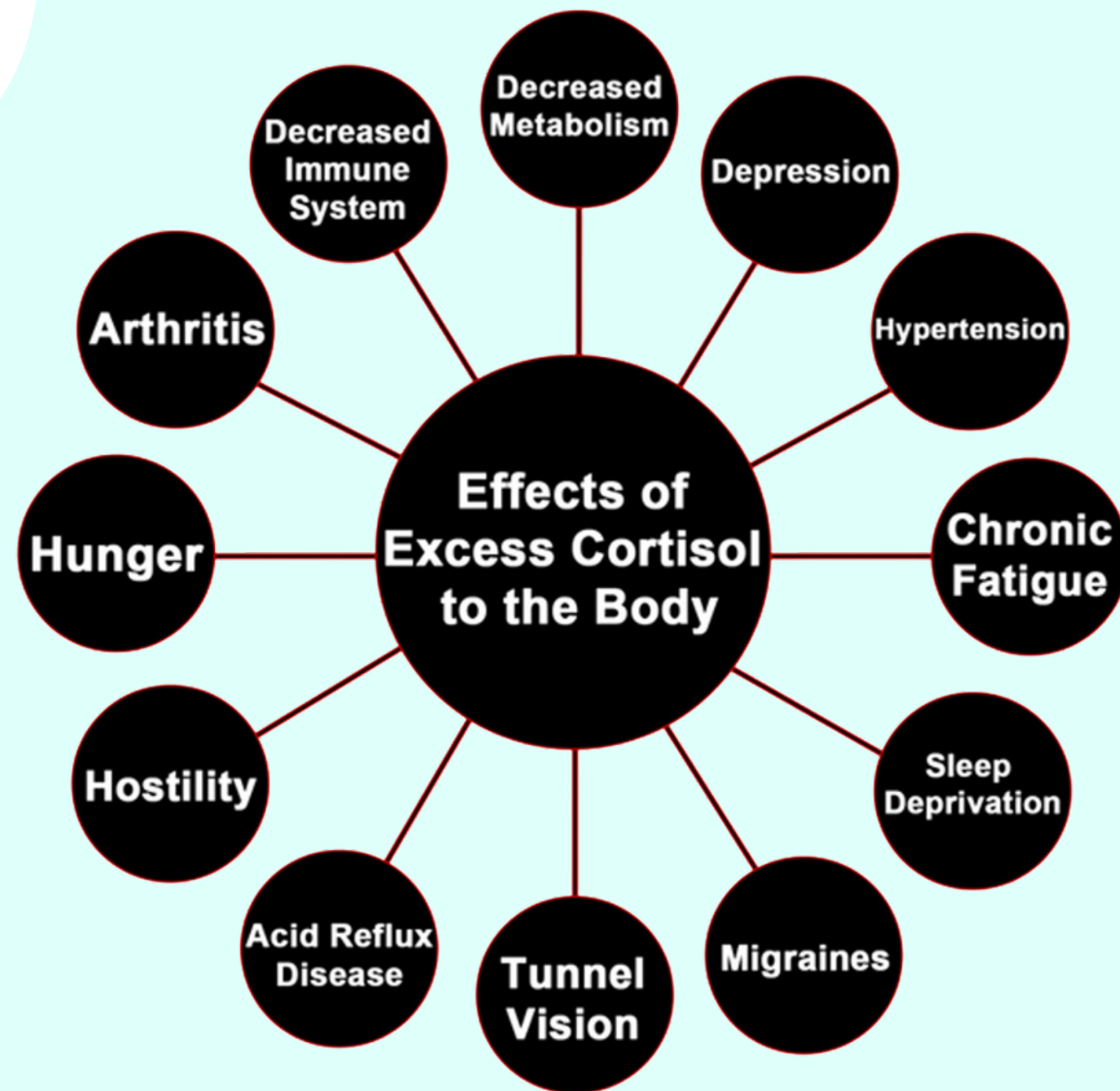


Biomolecular Approaches



Cortisol

- Stress hormone
 - Produced by the adrenal gland
 - The body's natural response to physical or psychosocial stress
 - Short-term= fight-or-flight



Cortisol

- Stress hormone
 - Produced by the adrenal gland
 - The body's natural response to physical or psychosocial stress
 - Short-term= fight-or-flight
 - Long-term= potentially severe consequences
 - Uniquely human problem



Cortisol

- Is persistent stress a modern problem?
- When in human history did persistent stress appear?
- Can stress tell us something about cause of death?
- Does elevated cortisol occur with other disease processes?

Assessing individual systemic stress through cortisol analysis of archaeological hair

Emily Webb ^a  , Steven Thomson ^b, Andrew Nelson ^a, Christine White ^a, Gideon Koren ^{b, c, d, h}, Michael Rieder ^{b, c, d, e, f, g}, Stan Van Uum ^{c, e}



International Journal of
Paleopathology

Volume 43, December 2023, Pages 1-6



Cortisol in deciduous tooth tissues: A potential metric for assessing stress exposure in archaeological and living populations

Leslie Quade ^a  , Miroslav Králík ^a, Petra Bencúrová ^b, Erin C. Dunn ^c



BRIEF COMMUNICATION |  Open Access |    

Desperately seeking stress: A pilot study of cortisol in archaeological tooth structures

Leslie Quade , Paul L. Chazot, Rebecca Gowland

International Journal of Paleopathology

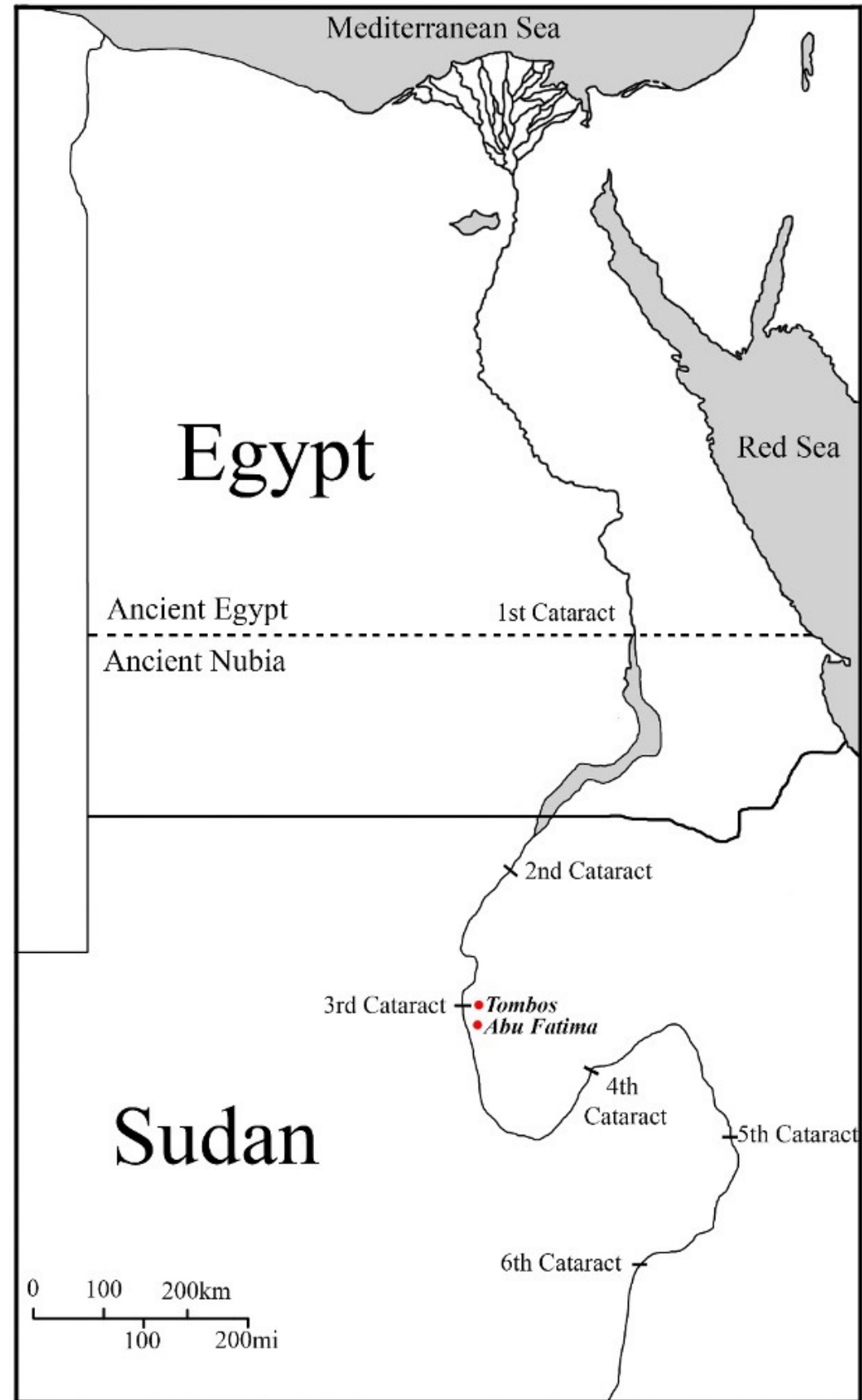
Volume 9, June 2015, Pages 28-37

Integrating cortisol and isotopic analyses of archaeological hair: Elucidating juvenile ante-mortem stress and behaviour

Emily C. Webb ^a  , Christine D. White ^a, Stan Van Uum ^b, Fred J. Longstaffe ^c

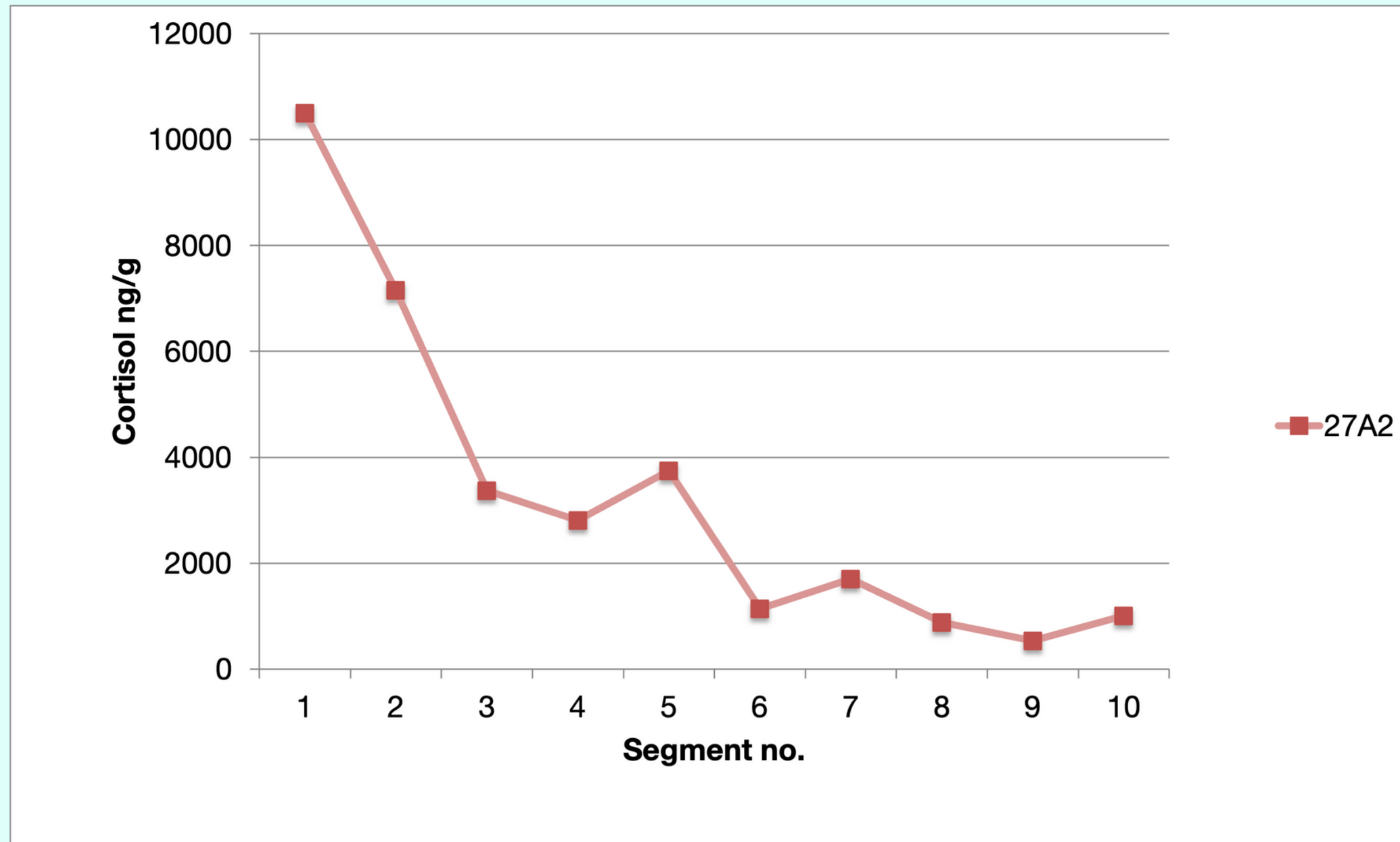
Cortisol

- How do we study cortisol in past populations?
 - This has been shown to work in hair and teeth
 - Hair is particularly interesting because:
 - It provides information close to the time of death
 - It creates a record in the months and years leading up to death
 - Biomolecules preserve better IF hair is preserved

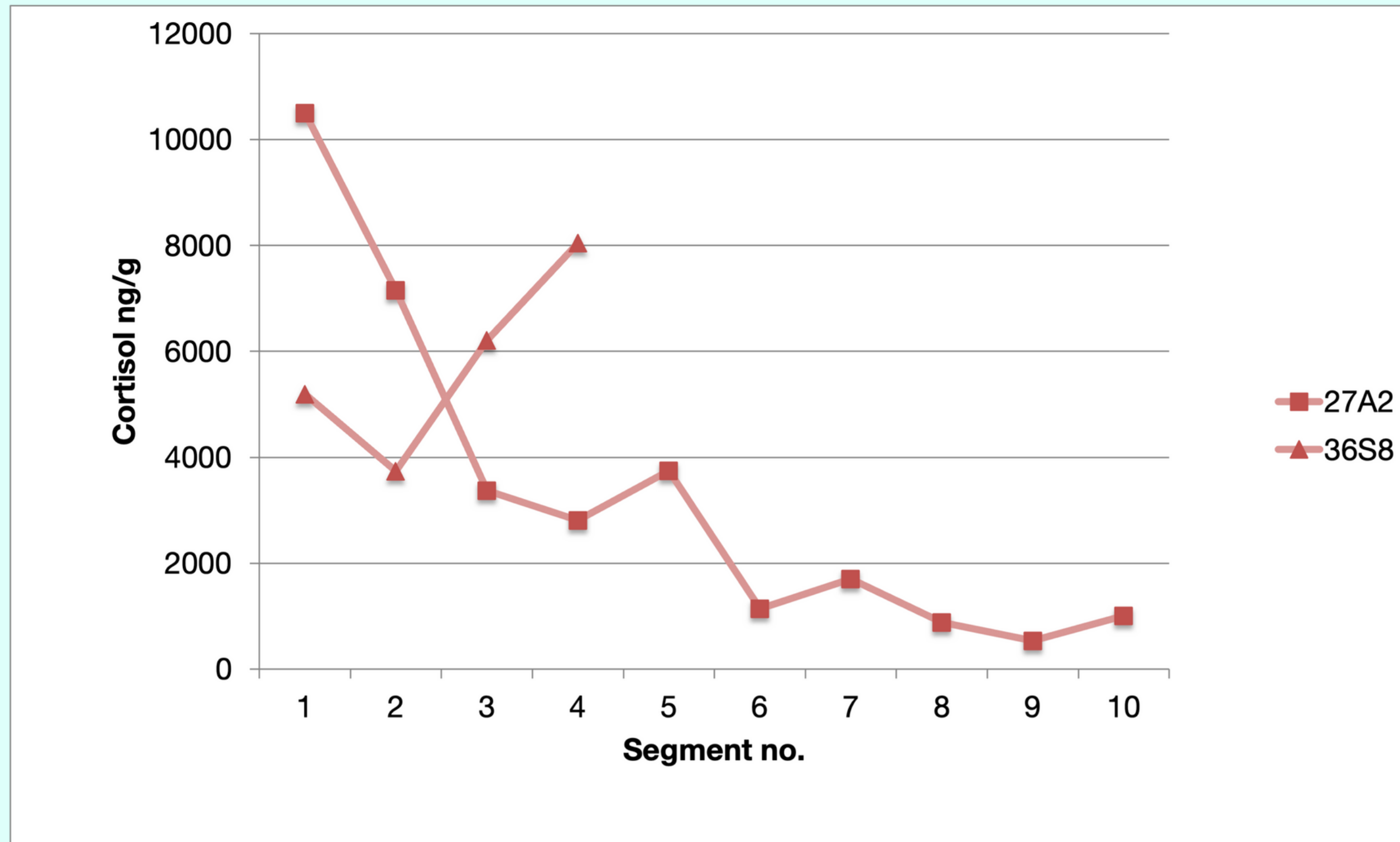


Cortisol

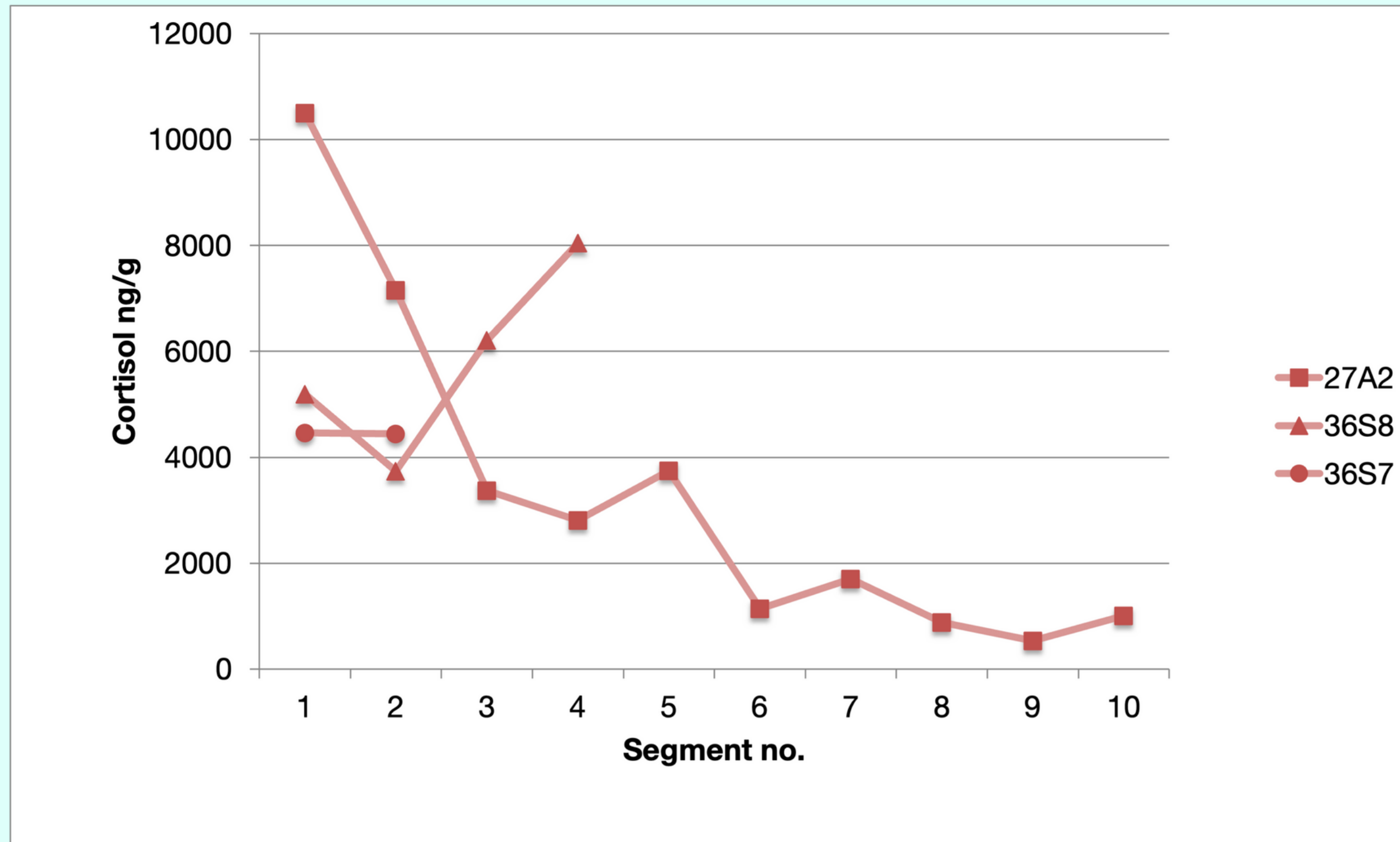
- Ancient Kerma (2500–1500 BCE) & New Kingdom (1500–1064 BCE)
- Excellent preservation, including hair
- Research questions:
 - Was chronic stress present in the ancient Nile Valley?
 - If so, did elevated levels of cortisol put an individual at greater risk of death?
 - Did chronic stress co-occur with other skeletal indicators of stress?



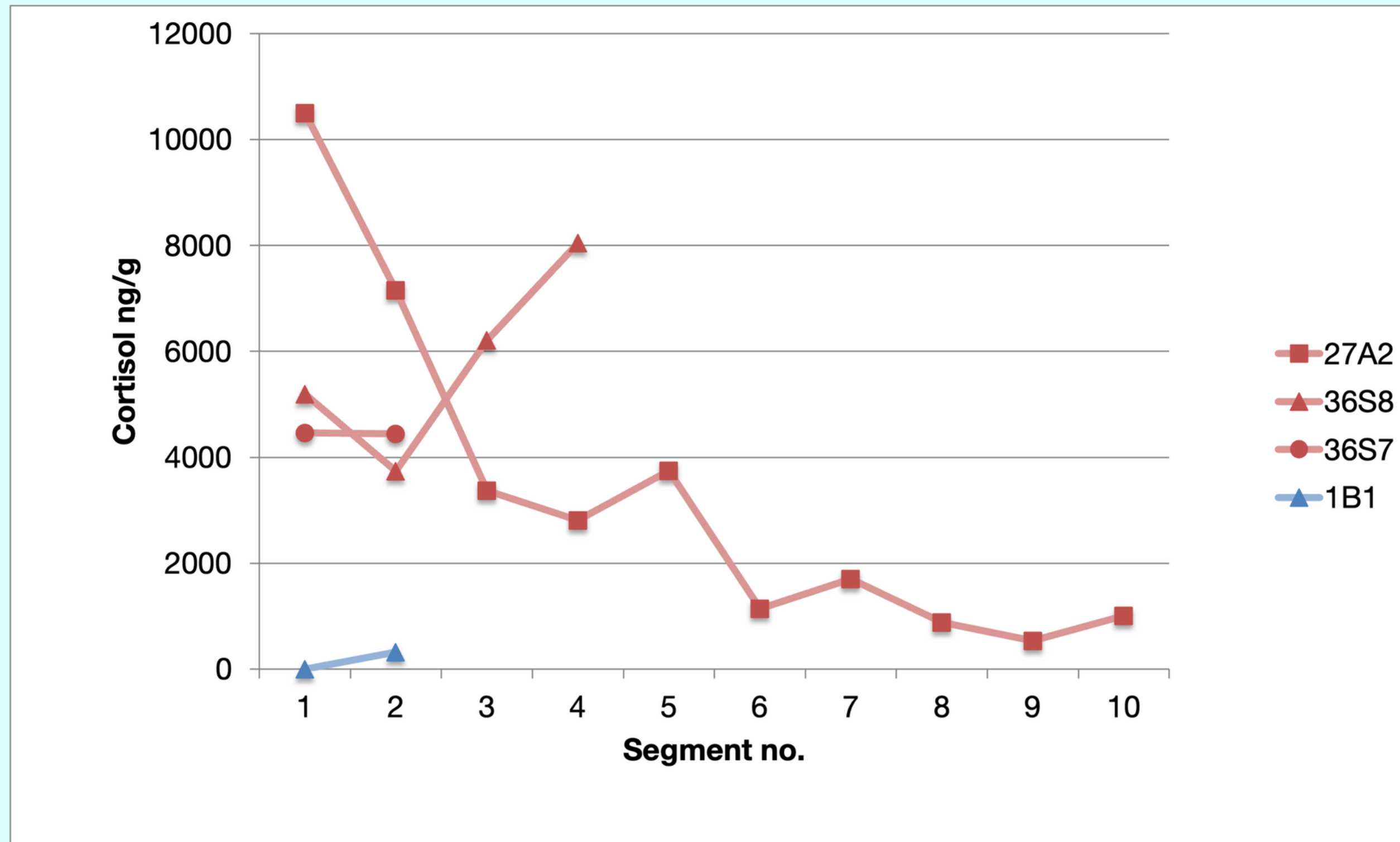
Segment 1= scalp-1cm (ca. 1 month prior to death); Segment 2=1cm-2cm (ca. 2 months prior to death)....



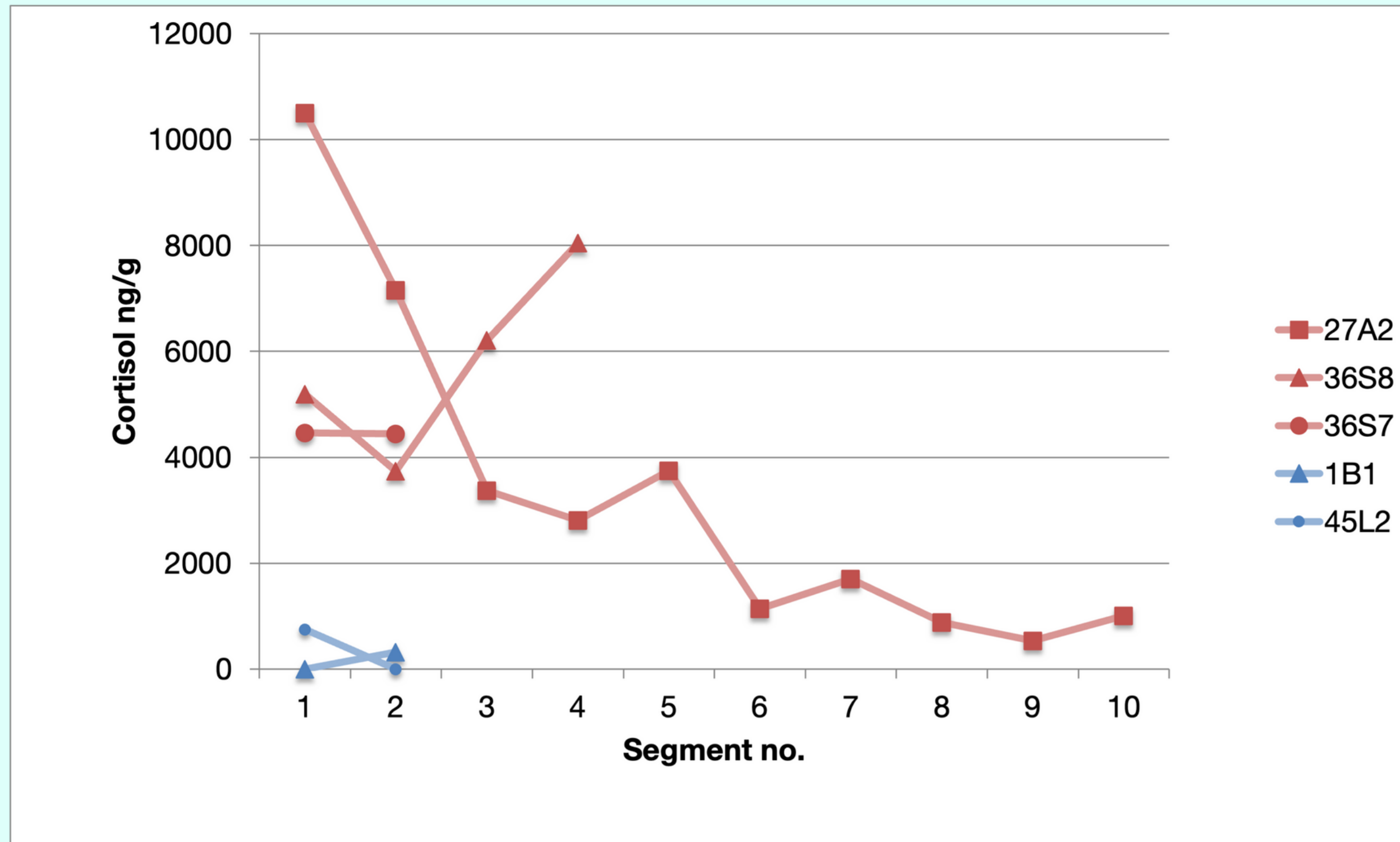
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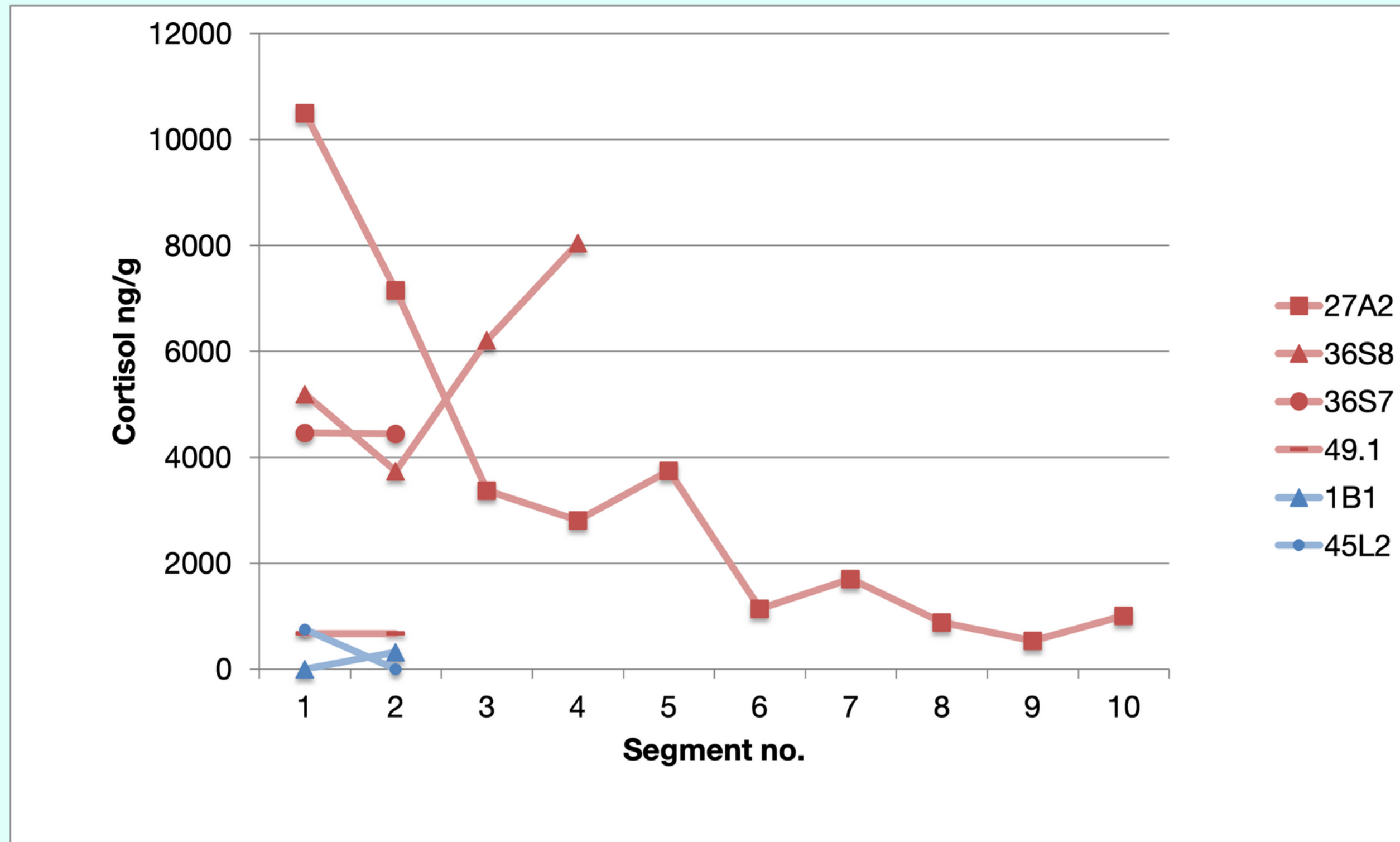
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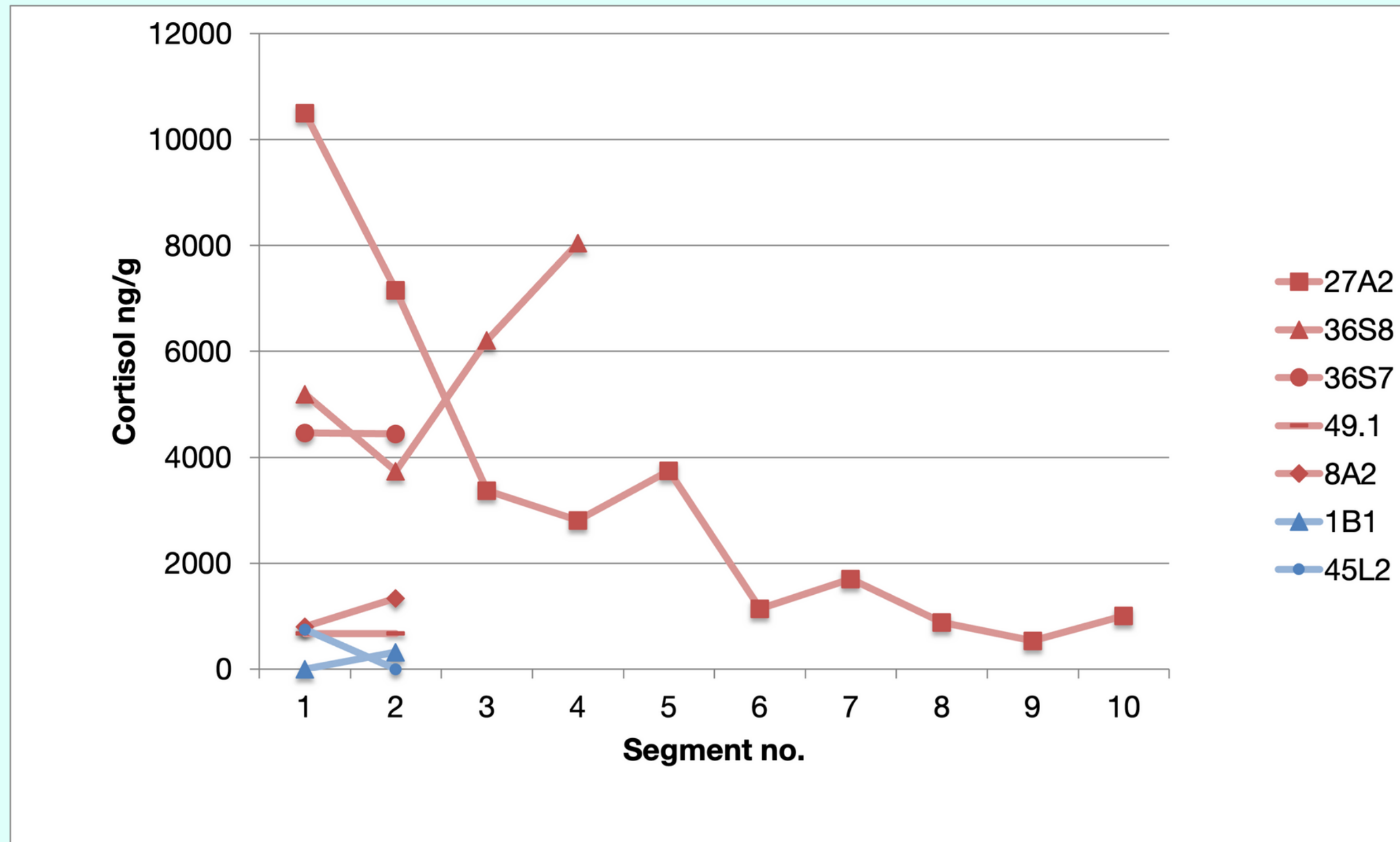
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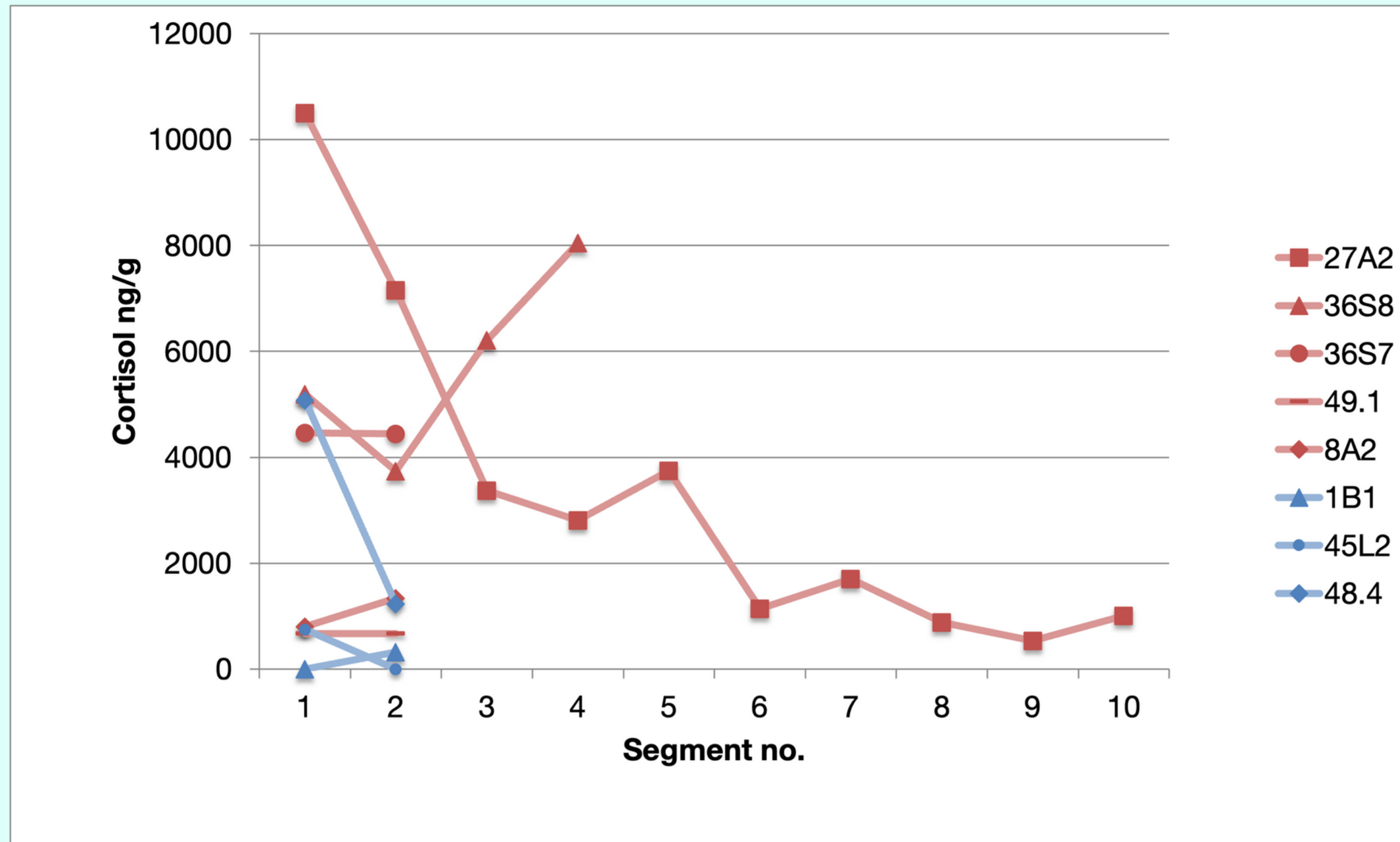
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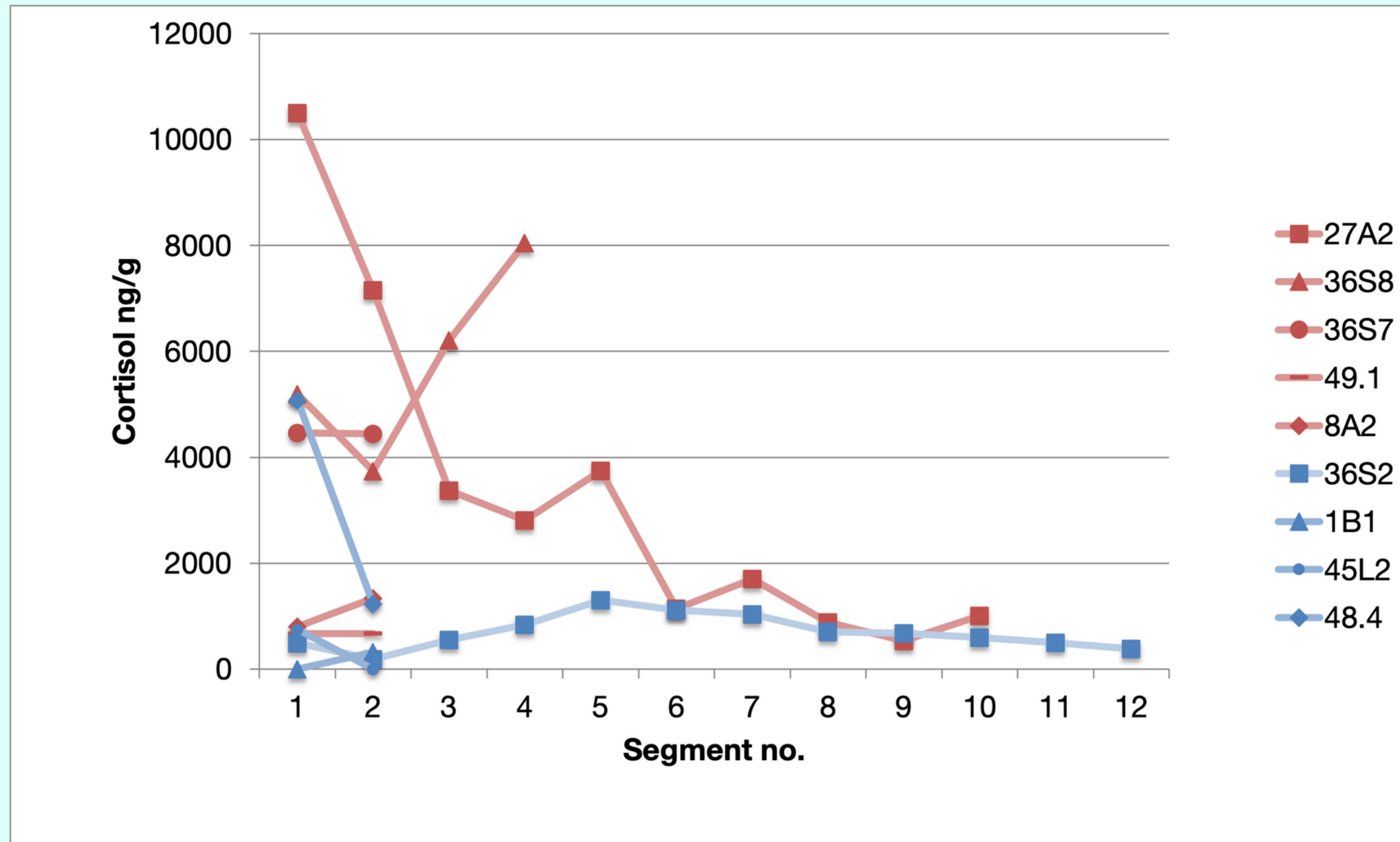
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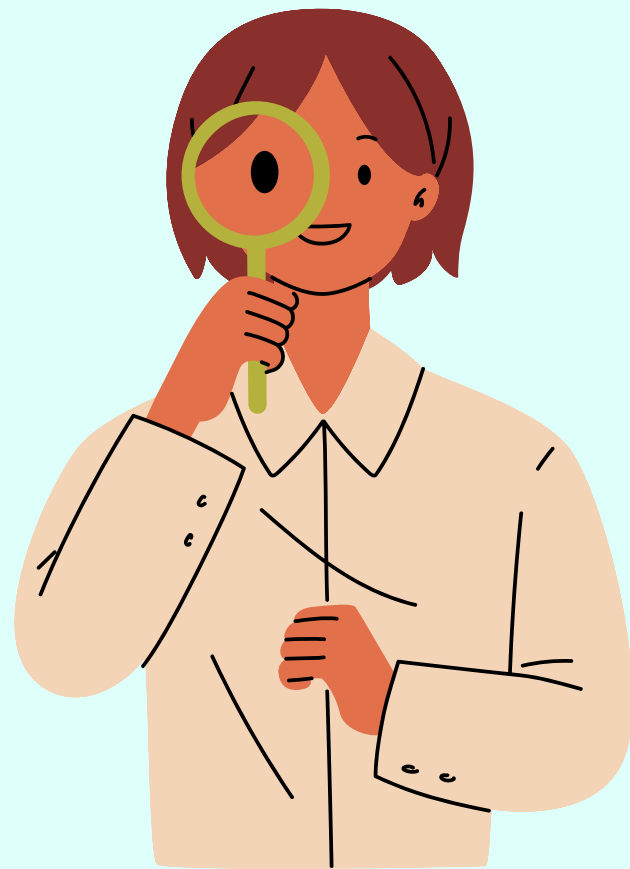
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Segment 1= scalp-1cm (ca. 1 month prior to death); Segment 2=1cm-2cm (ca. 2 months prior to death)....



Cortisol

- Some may fit model
- Some do not
 - May have died before skeletal stress lesion developed
 - Skeletal stress indicator causation may not be linked to cortisol response



Cortisol

- Next Steps:
 - Highly sensitive equipment and replication studies
 - Bone, Teeth, Hair



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Embodied Inequality



Embodied Inequality

- Will investigate how socioeconomic inequality was embodied during the Kerma Period
 - Through time (2500–1500 BCE)
 - Urban v. Rural
 - Migrants v. Locals
 - Mortuary context

Thank You!

This presentation is part of the project The Evolution of Stress (with project number 406.XS.01.118) of the research programme Open Competition which is financed by the Dutch Research Council (NWO).

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[@DrSarahSchrader](https://twitter.com/DrSarahSchrader)



Citations

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