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## BACKGROUND

- Increased access to information through the internet has led patients to actively seek care for themselves.<sup>1</sup>
- Over 90% of patients consult the internet when choosing a provider.<sup>2</sup>
- To cater to this trend, healthcare providers are increasingly incorporating personal details into their online biographies to assist patients in their search for care.<sup>3</sup>
- Endocrine surgery is unique due to its gender-diversity, longitudinal patient care, and demands of high levels of counseling and shared decision making.<sup>4</sup>
- Additionally, it's limited public familiarity, variable institutional labeling, and geographically uneven distribution of surgeons makes online biographies even more important.<sup>4</sup>
- Linguistic Inquiry and Word Count (LIWC-22) is a validated psycholinguistic tool that quantified language features across several dimensions, including Analytic thinking, Clout, Authenticity, and Tone.<sup>5</sup>

## HYPOTHESIS & AIMS

**Hypothesis:** Linguistic patterns in endocrine surgeons' online biographies vary by demographic and practice characteristics, with practice environment and gender having the most significant impacts.

**Primary Outcome:** Association between physician characteristics — gender, region of medical school, residency, fellowship, and current practice; institution type; graduation year — and LIWC-22 scores: Word Count, Analytic, Clout, Authentic, and Tone.

## METHODS

**Design.** Retrospective review of all American Association of Endocrine Surgeons (AAES) accredited fellowship graduates from 2014 to 2024. The AAES website was used to identify accredited programs and graduates during the study period.

**Identification.** Each graduate's biography was identified through a standardized Google search using first and last name, with additional terms as needed ("MD", "DO", "endocrine"). US News, LinkedIn, and similar third-party sites were not used.

**Linguistic analysis.** Biographies were copied to a text document, exported to PDF, and uploaded to LIWC-22, which produces scores (1–100) for Word Count, Analytic, Clout, Authentic, and Tone. Graduates without a biography were retained for demographic analyses but excluded from linguistic analyses.

**Variables.** Gender; state and region of medical school, residency, fellowship, and current practice; academic vs. community practice; institution name; graduation year. Regions classified per US Census/CDC categories: Midwest, Northeast, South, West, and Other (including international graduates).

**Statistics.** ANOVA for multi-level variables (region, graduation year); unpaired t-test for gender and institution type; chi-square for biography availability. Median [95% CI] reported for descriptive statistics;  $p < 0.05$  considered significant. Missing data points were excluded from the relevant analysis only. All analyses performed in RStudio v2024.12.1.

**Table 1. Baseline demographics of AAES fellowship graduates, 2014-2024**

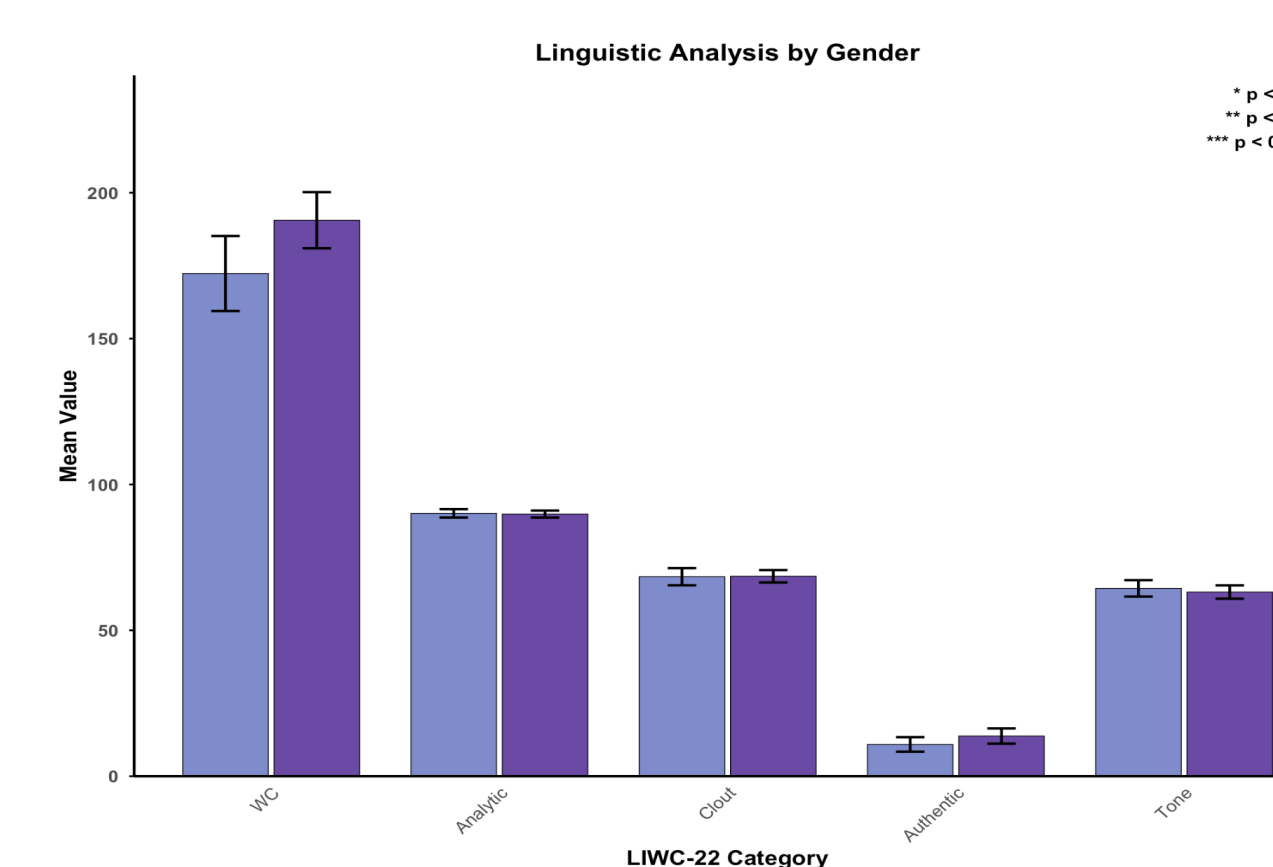
Characteristic	n (%)
Graduates identified	252
Male	99 (39.8)
Female	153 (60.2)
Biographies available	187
Male	72 (39.3)
Female	115 (60.7)
Region of medical school	
Midwest	42 (16.7)
Northeast	69 (27.4)
South	63 (25.0)
West	17 (6.7)
Other / Unknown	61 (24.2)
Region of residency	
Midwest	47 (18.7)
Northeast	77 (30.6)
South	62 (24.6)
West	31 (12.3)
Other / Unknown	35 (13.9)
Region of fellowship	
Midwest	78 (31.0)
Northeast	66 (26.2)
South	67 (26.6)
West	29 (11.5)
Other	12 (4.8)
Region of current practice	
Midwest	47 (18.7)
Northeast	58 (23.0)
South	87 (34.5)
West	38 (15.1)
Other / Unknown	22 (8.7)
Type of practice	
Academic	117 (46.4)
Community	132 (52.4)
Unknown	3 (1.2)

## RESULTS

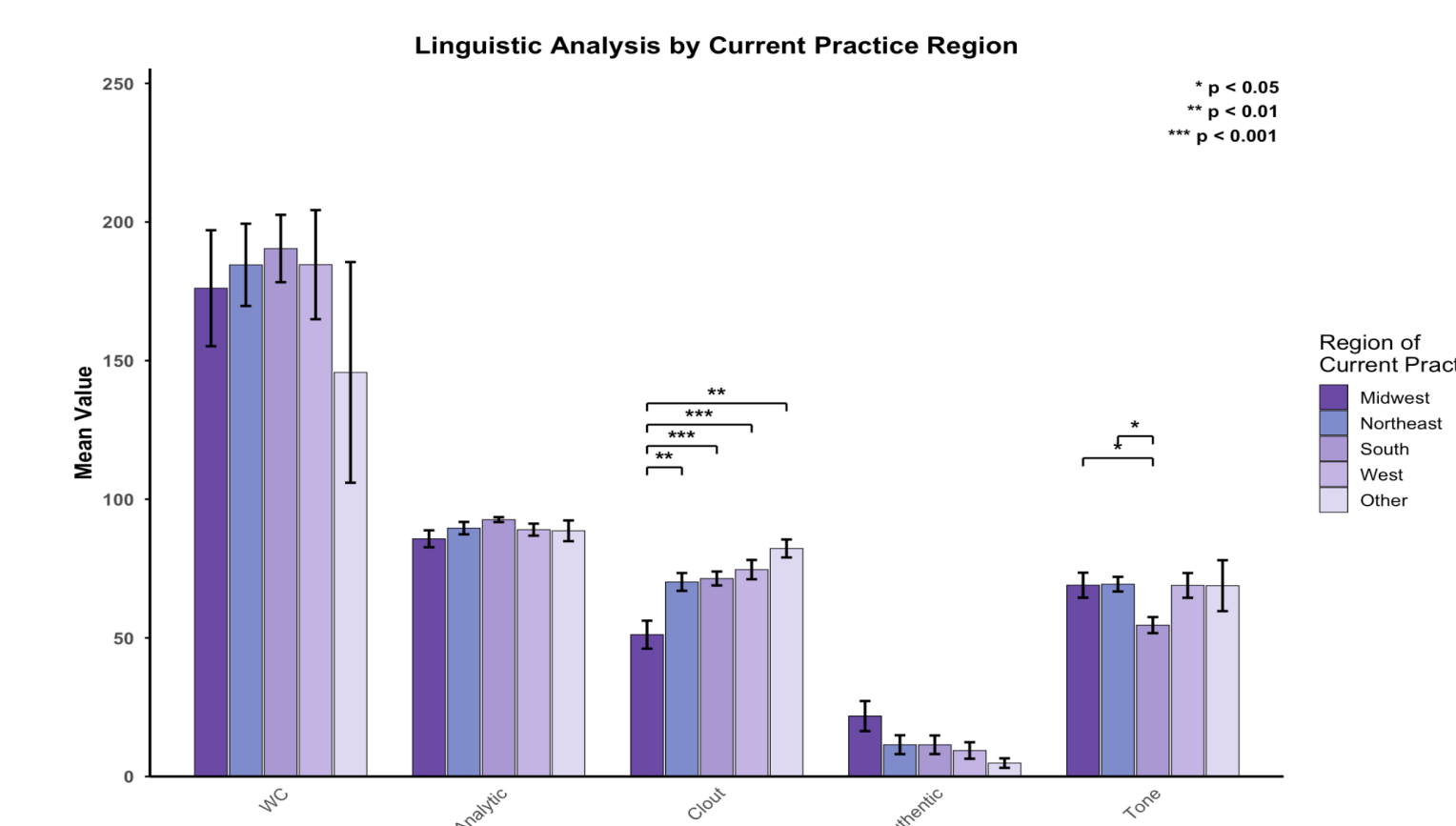
**Gender and length of practice had no effect.** There was no difference in any score when comparing genders or graduating year (Figure 1).

**Region of Training had minimal effect.** There was no difference in any score when comparing medical school region; residency region showed a single difference (South > Midwest in Clout); fellowship region showed a single difference (West > South in Tone) (Figure 2).

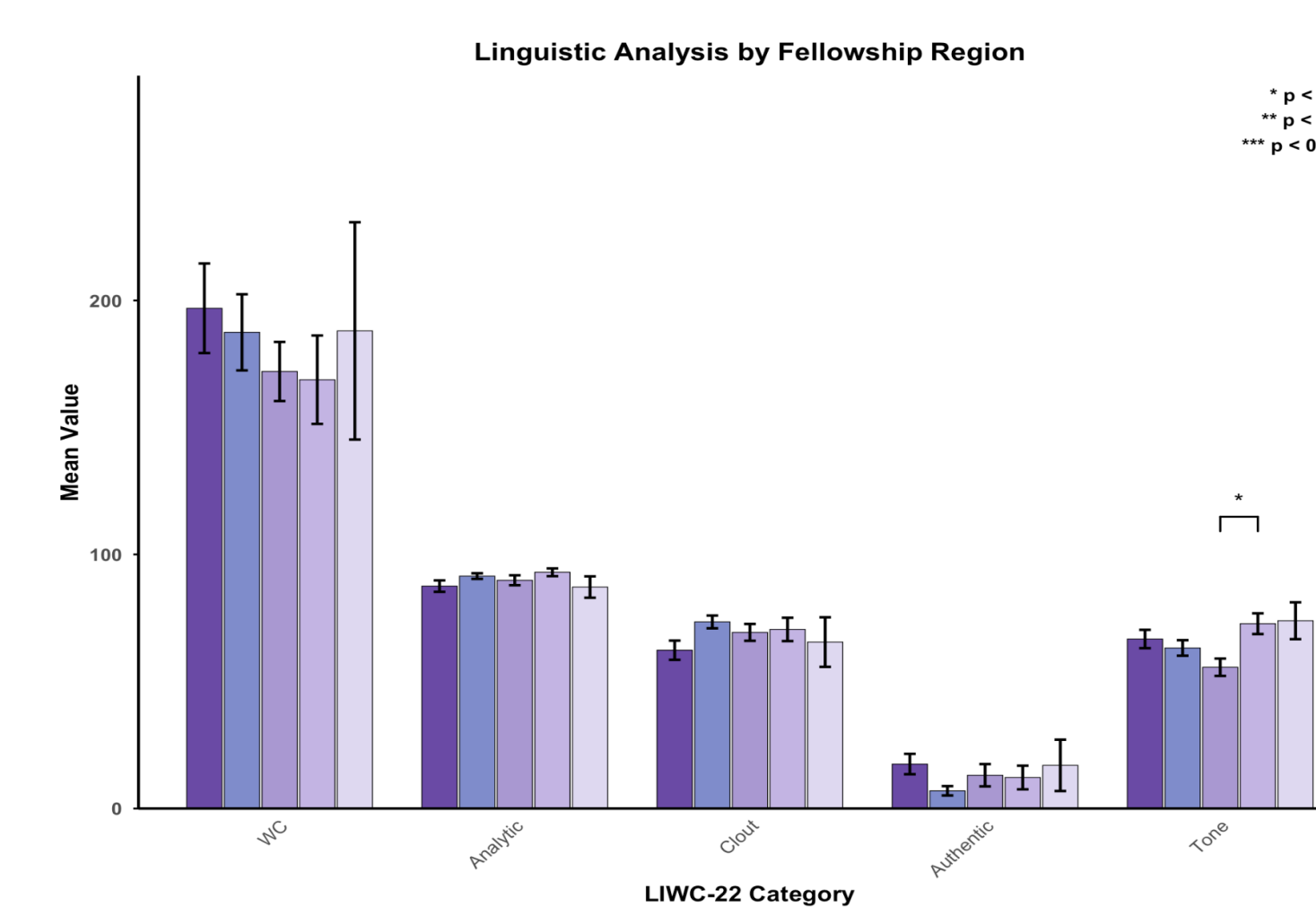
**Practice environment was the dominant driver.** Current practice region was significantly associated with both Clout ( $p < 0.001$ ) and Tone ( $p < 0.01$ ). Institution type drove the largest effects: academic surgeons scored higher in Analytic ( $p < 0.001$ ) and lower in Tone ( $p < 0.05$ ) than community surgeons (Figures 3 and 4).



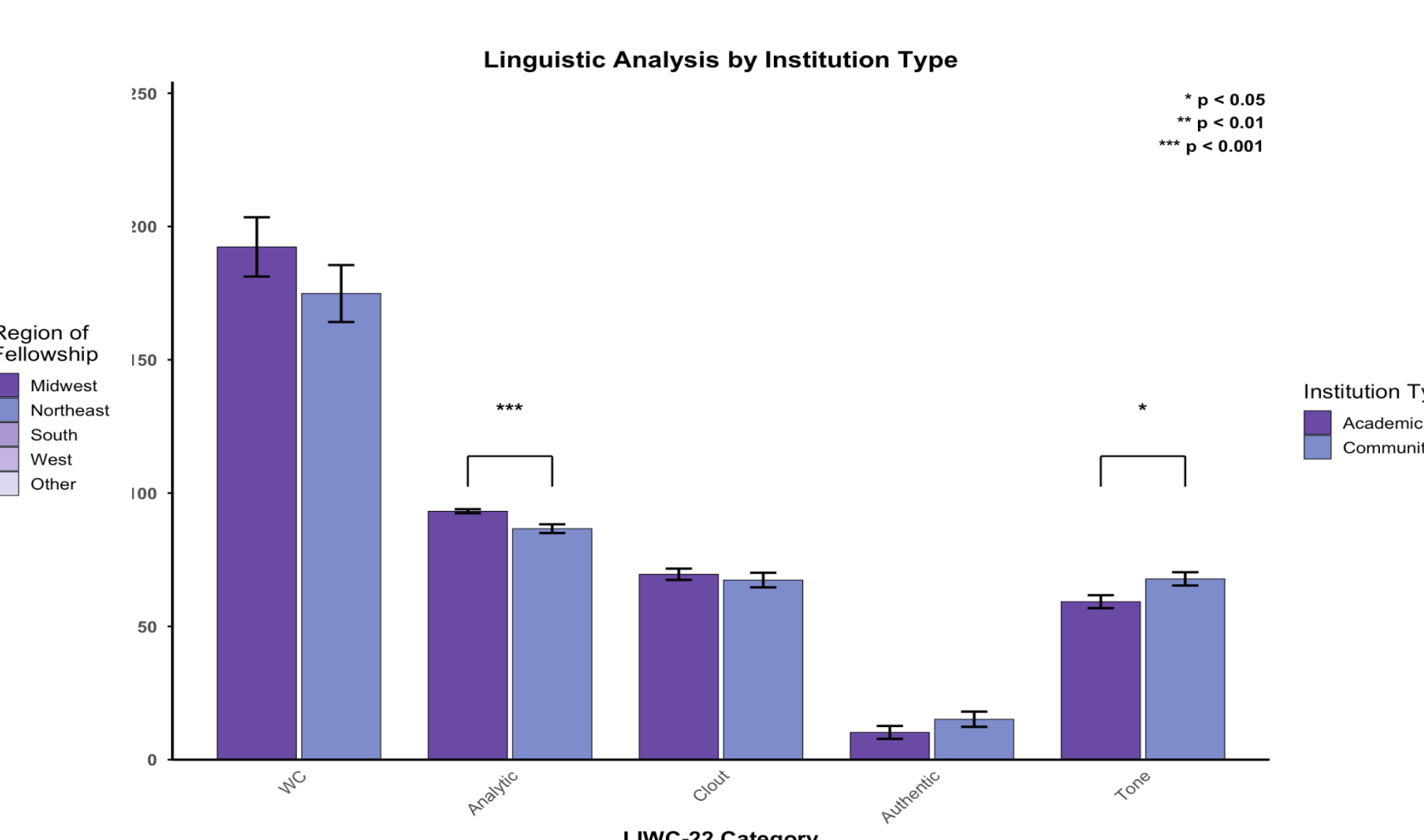
**Figure 1. By Gender**  
Despite 61% of the cohort being female, no significant linguistic differences were observed between men and women.



**Figure 3. By Current Practice Region**  
Midwest had significantly lower Clout vs. East, South, West ( $p < 0.001$ ) and Other ( $p < 0.01$ ). South had lower Tone vs. Midwest and Northeast ( $p < 0.05$ ).



**Figure 2. By Fellowship Region**  
Fellowship region showed a single significant effect: West > South in Tone ( $p < 0.05$ ); other categories were comparable across regions.



**Figure 4. By Institution Type**  
Academic surgeons scored higher in Analytic ( $p < 0.001$ ) and lower in Tone ( $p < 0.05$ ) than community-practice surgeons.

## CONCLUSIONS

This is the first study to apply validated psycholinguistic analysis to the biographies of surgeons. By quantifying these patterns, our research introduces a novel foundation for understanding how physicians communicate expertise, authority, and approachability online. Four key findings emerged:

- **Practice environment is the dominant driver.** Endocrine surgeons' online biographies vary linguistically by where and how they practice — not by gender, medical school, or graduation year. The training environment plays a limited role in shaping online self-presentation.
- **Academic vs. community surgeons communicate distinctly.** Academic surgeons use more formal, analytic, hierarchical language, consistent with institutional emphasis on research productivity and leadership. Community surgeons project warmer, more emotionally positive tones — patterns aligned with patient-centered messaging and accessibility-focused marketing.
- **Implications for the field.** As physician websites increasingly guide patient decision-making, understanding these patterns can inform best practices for crafting biographies that balance professionalism with warmth and relatability — supporting transparent, patient-centered communication and helping physicians match with patients who value their particular style.
- **Future directions.** Building on these findings, future research should examine how linguistic framing actually influences patient behavior and engagement — moving from describing variation to demonstrating its downstream effects.