

Microbial Burden and Socioeconomic Predictors of Amputation Risk in Diabetic Foot Ulcers: A Statewide Retrospective Analysis



Kaitlyn Depinet^{1, 2}; Bryce Hockman^{1, 2}; David A. Ajayi³; Rodica Muraru²; Zachary Carr⁴; Beth Altenburger¹; Jaimee Haan¹; Gregory Westin^{1, 2}; Emma Holler²; Christopher A. Harle^{3, 4, 5}; Mithun Sinha^{1, 2}
¹ Comprehensive Wound Center, Indiana University Health, Indianapolis, IN; ² Department of Surgery, Indiana University School of Medicine, Indianapolis, IN; ³ Department of Health Policy and Management, Fairbanks School of Public Health, Indianapolis, IN; ⁴ Regenstrief Institute, Indianapolis, IN; ⁵ Center for Diabetes and Metabolic Diseases, Indiana University School of Medicine, Indianapolis, IN

Introduction

Diabetic foot ulcers (DFUs) are a major driver of hospitalization and lower-extremity amputation.

- Infection and osteomyelitis are established clinical risk factors for poor DFU outcomes.
- Less is known about how microbial burden and socioeconomic context jointly relate to amputation risk at a population level.

Primary Objective

- Evaluate associations between infection characteristics (including osteomyelitis and microbial patterns) and amputation risk in DFU.

Secondary Objective

- Describe socioeconomic patterns in DFU prevalence using ZIP-code-level median household

Methods

Design & Data Source

- Retrospective cohort study using the Indiana Network for Patient Care (INPC) health information exchange, 2019–2024.

Population

- 27,078 patients with DFU identified using ICD/CPT-based case definitions.

Measures

- Demographics, culture results (when available), osteomyelitis codes, amputation procedure codes, and ZIP-code-level median household income.

Analyses

- Logistic regression to estimate odds of amputation associated with osteomyelitis and microbial patterns.
- Correlation analysis to evaluate association between income and DFU prevalence by geography.

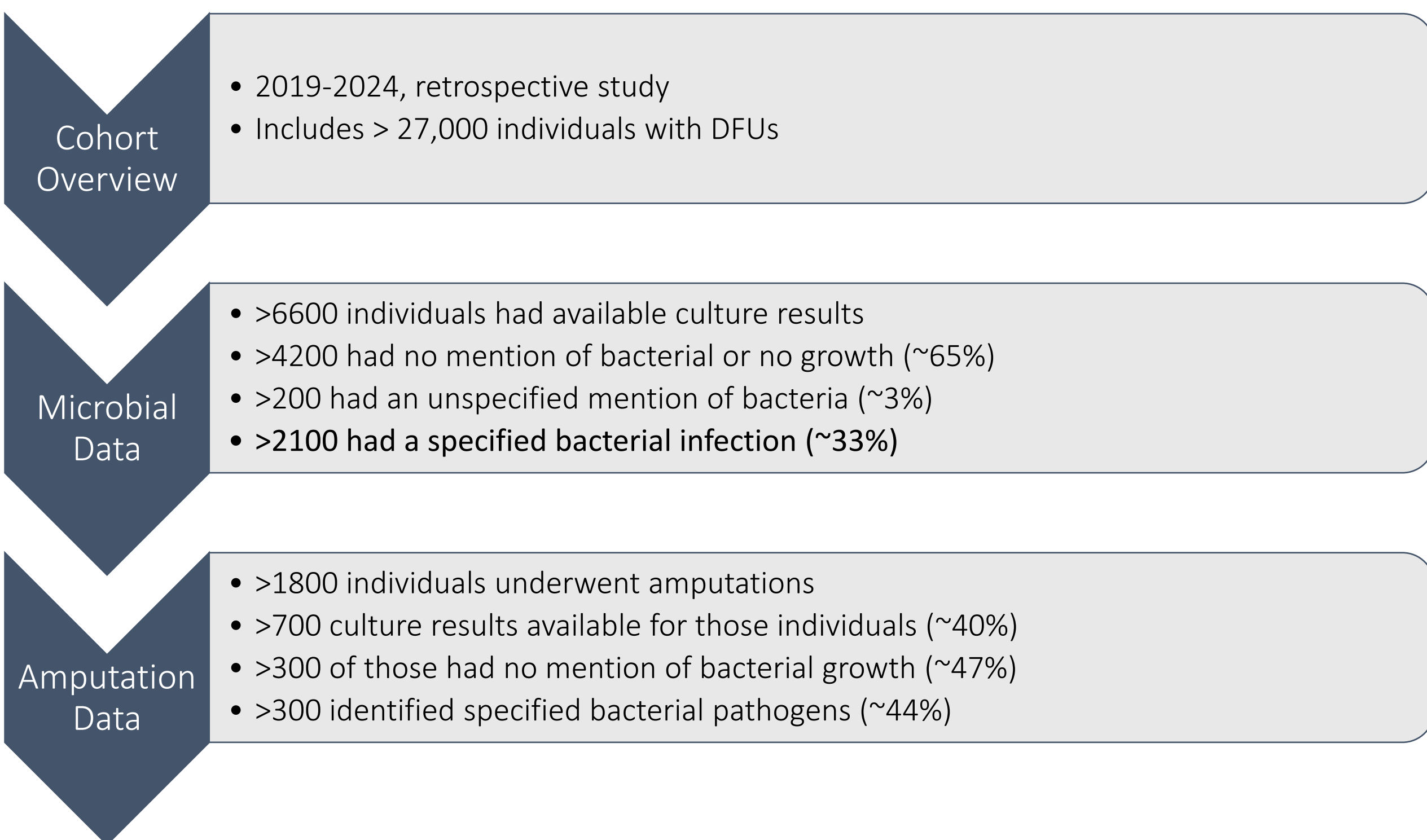


Figure 1: Data Description

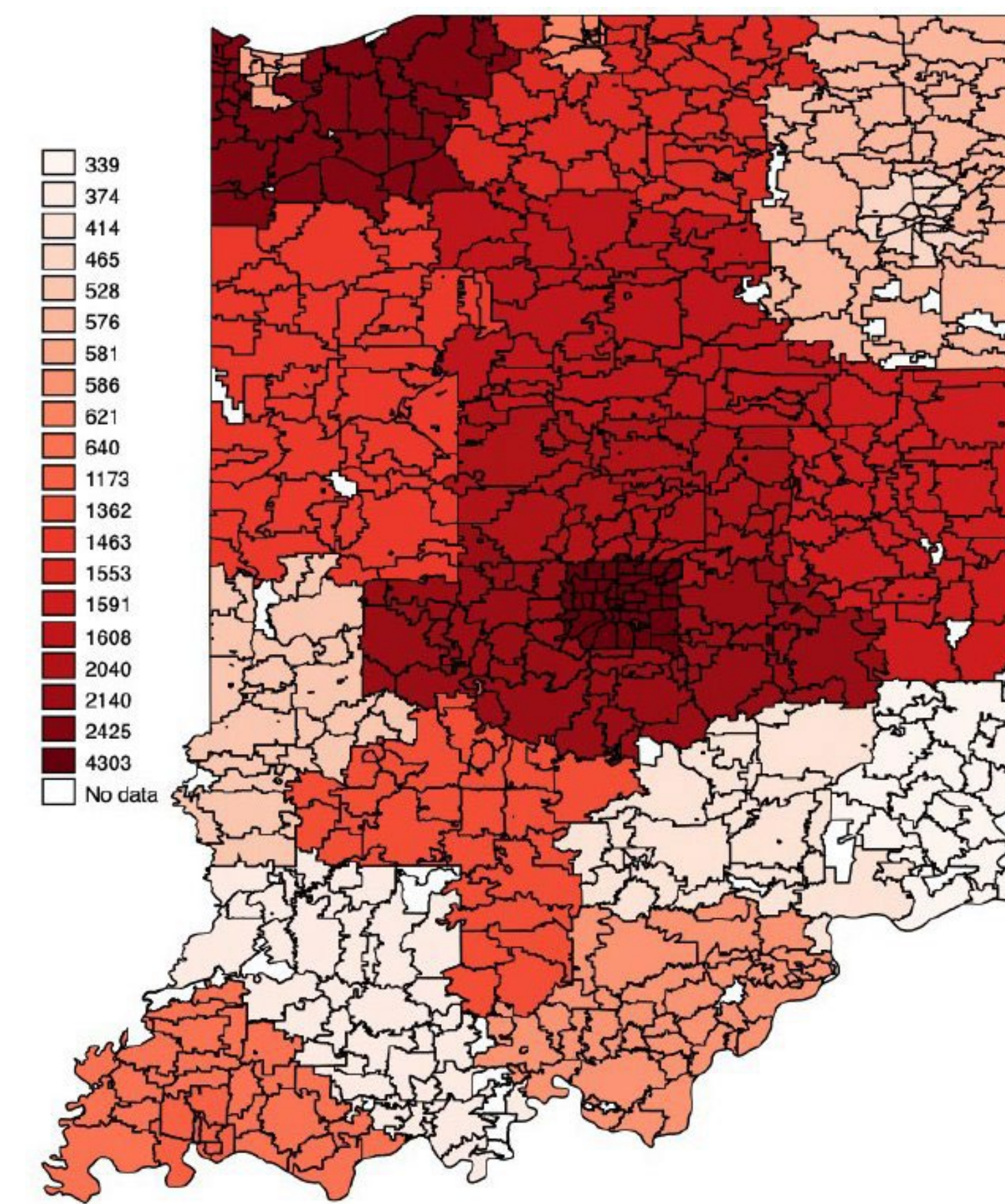


Figure 2: DFU Prevalence In Indiana Geographical Areas based on ZIP codes.

Socioeconomic Predictors of Amputation Risk

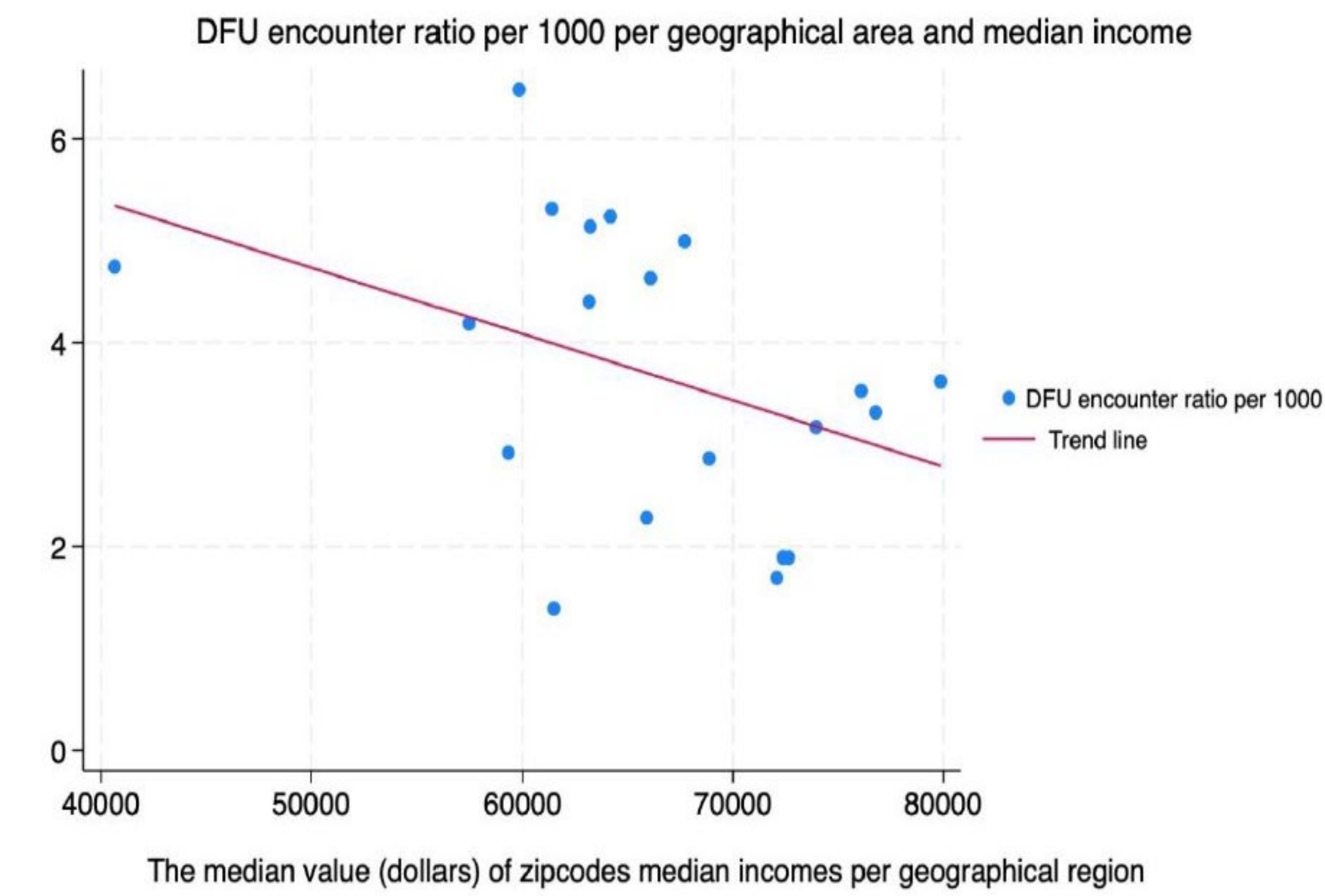


Figure 3: DFU association with ZIP-code-level median household income. DFU prevalence was higher in lower-income regions, demonstrating a significant inverse correlation between income and DFU prevalence ($r = -0.2108$, $p = 0.0016$).

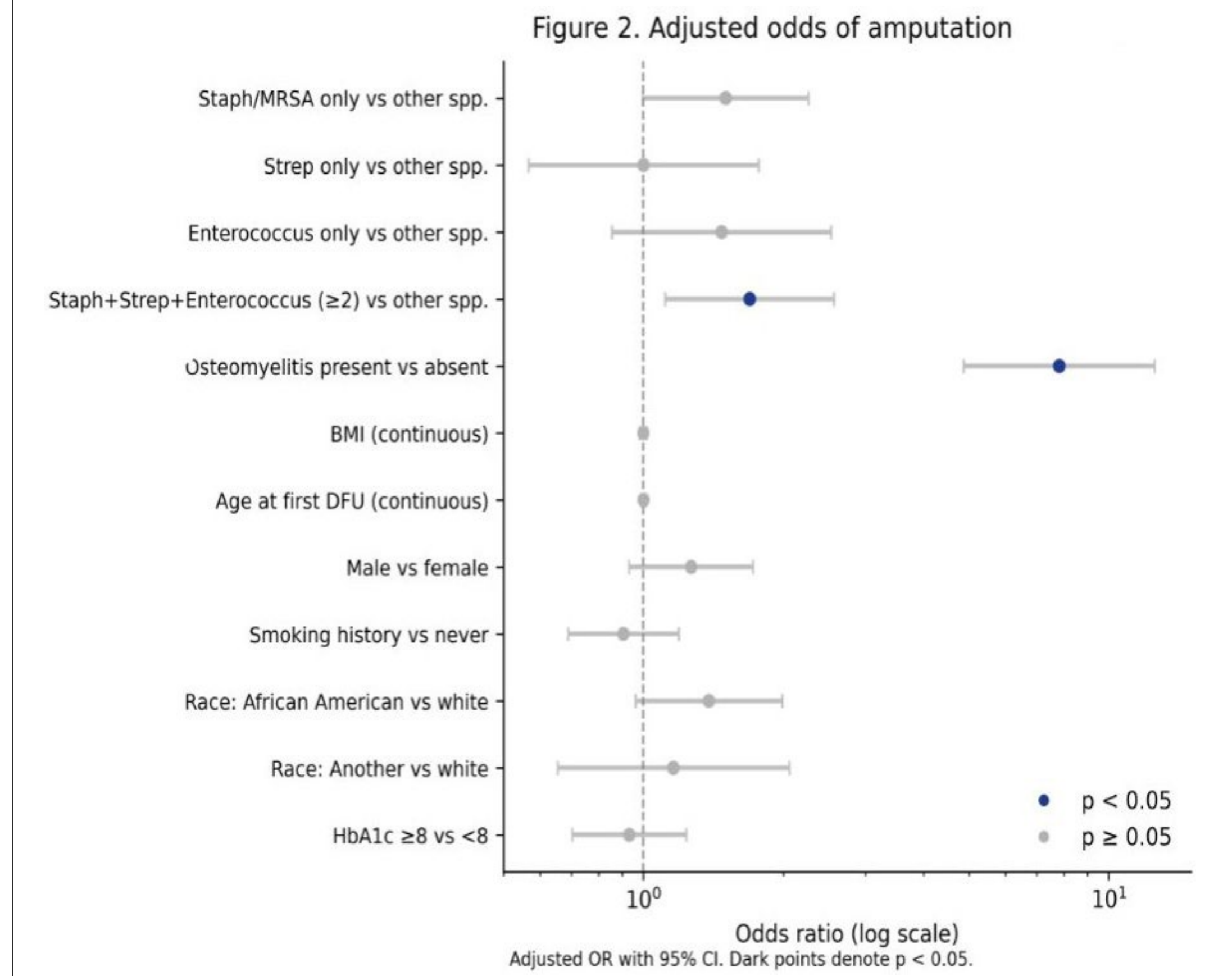


Figure 4: Adjusted odds of amputation with 95% CI (log scale). Dark points denote $p < 0.05$. Osteomyelitis and polymicrobial infection (≥ 2 among *Staphylococcus spp.*, *Streptococcus spp.*, *Enterococcus spp.*) are associated with higher amputation odds.

Results

Cohort

- 27,078 DFU patients (2019–2024).

Osteomyelitis

- Osteomyelitis was associated with markedly higher amputation odds (OR 7.83, $p < 0.001$).

Microbial Burden

- Polymicrobial infections involving ≥ 2 of the following: *Staphylococcus spp.*, *Streptococcus spp.*, *Enterococcus spp.* were associated with higher amputation risk (OR 1.69, $p = 0.013$).

• Among amputated cases with cultures available, the most frequently isolated genera were:

- *Staphylococcus spp.* (22.75%)
- *Enterococcus spp.* (11.86%)
- *Streptococcus spp.* (10.42%)

Socioeconomic Pattern

- DFU prevalence was inversely correlated with median income ($r = -0.2108$, $p = 0.0016$), with rates >5 per 1,000 residents in lower-income ZIP codes.

Conclusions

- Osteomyelitis and higher microbial burden are strongly associated with amputation risk in DFU.
- DFU prevalence is higher in lower-income communities, suggesting socioeconomic disparities in DFU burden.
- Results support earlier osteomyelitis detection, enhanced microbial diagnostics, and targeted prevention strategies in underserved regions.

References & Acknowledgements

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