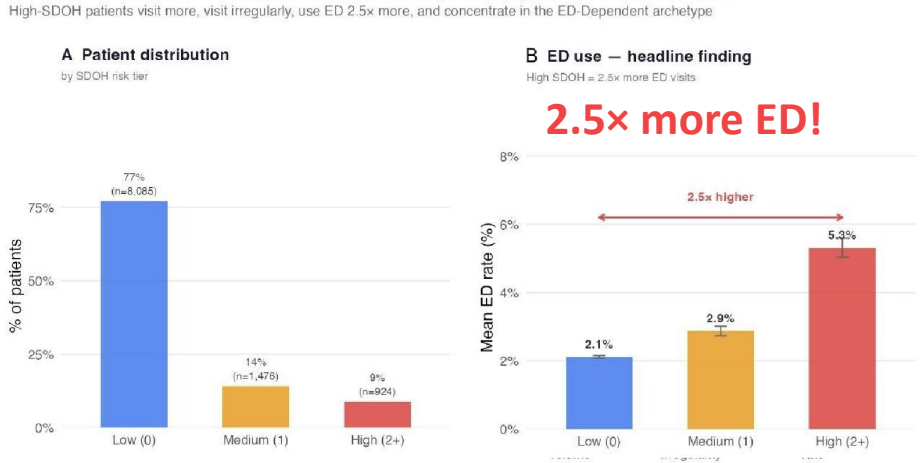
ASA DataFest 2026 · Duke University

From Patterns to Prevention: How Social Determinants Shape Type 2 Diabetes Care Pathways

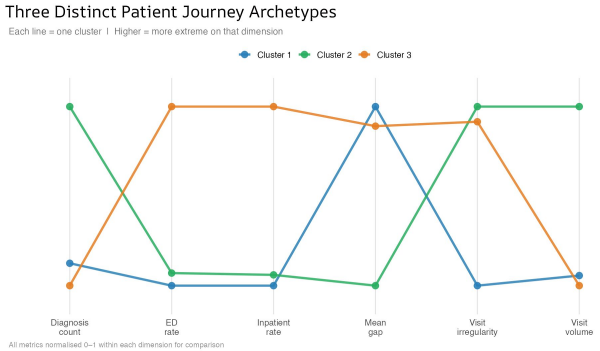
The Carolina Correlations:
Eric Hu, Ruitong Liu, Mia Zhou, Gloria Yang

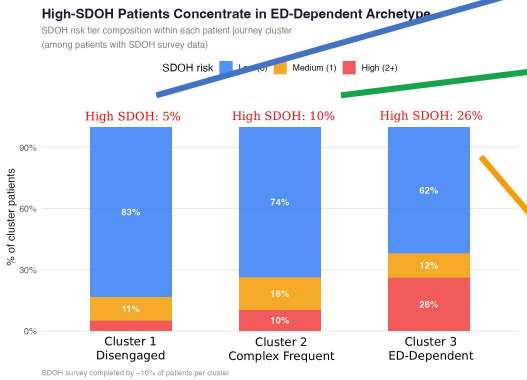
Markov Chain Prediction Network

Among top 20 most frequent diseases, we focused on the smaller comorbidity network consisting of Type 2 diabetes and four other related diseases



K-Mean clustering (k=3)





Cluster 1 (Disengaged)

Longest mean gap, lowest ED rate, fewest visits -> healthier or simply don't engage often

Cluster 2 (Complex Frequent)

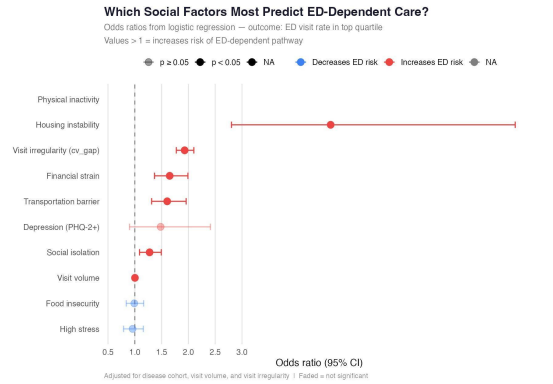
Shortest mean gap, high diagnosis count, most irregular rhythm -> complex conditions and are actively using the system

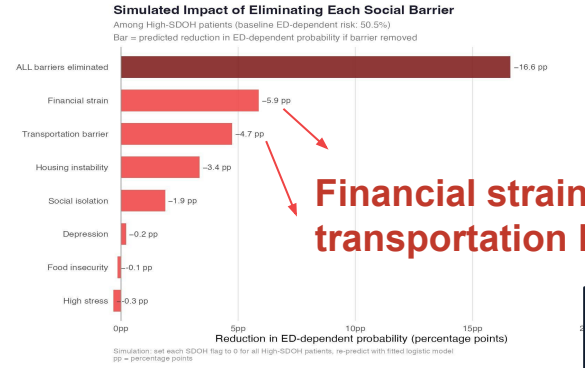
Cluster 3 (ED dependent)

Highest ED rate, moderate visit volume, moderate irregularity -> social barriers delay care & rely on emergency services

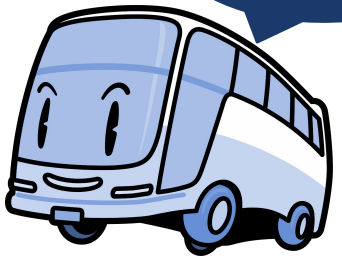
From call to action: Mobile Shuttles to lower ED rate

Click me for the shuttle dashboard!

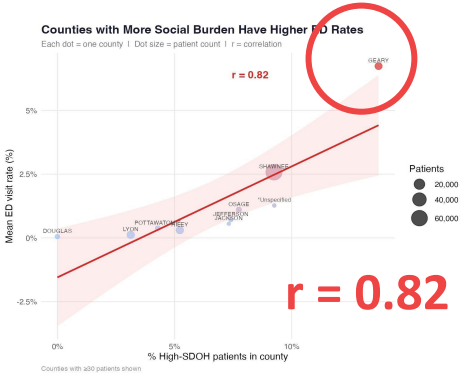


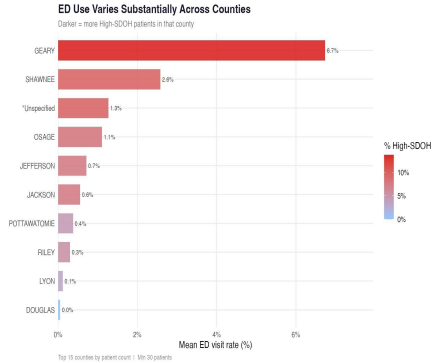


Financial strain (-5.9%) & transportation limit (-4.7%)!

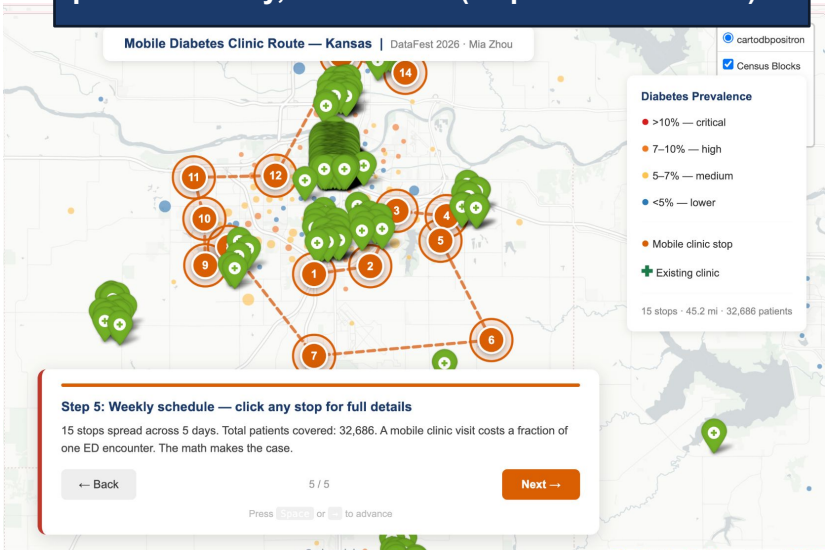


Nearest-neighbor algorithm based on prevalence, patient density, and access (15 prioritised nodes)



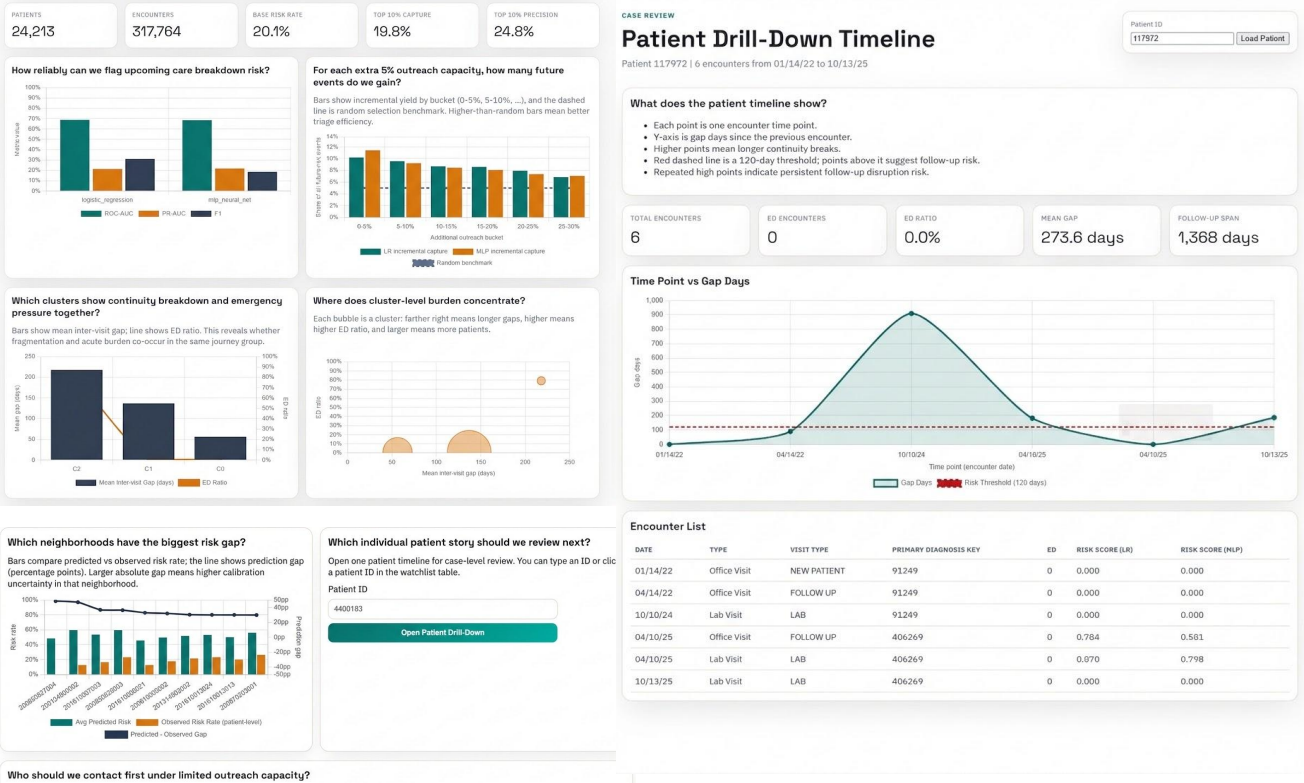


Geary County: 6.7% ED rate (highest SD burden)



45 miles, covering over 32,000 patients.

From risk to action: ML-Driven Early Alert for Care Pathway Disruption



Problem: Access barriers → silent disengagement → preventable ED crisis

Composite target: 90-day ED risk + visit gap > 120 days

Scoring: Every encounter ranked → priority contact list

Incremental capture: Each +5% outreach → marginal burden captured vs. random

Patient profile: Repeated 120-day crossings → proactive outreach trigger

Population guidance: Cluster & neighborhood panels → cohort-level deployment

Bottom line: Risk score + thresholds + contact list = executable early warning

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THANK YOU!!

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