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Linking Geriatric Emergency Departments Using Deterministic and Machine Learning Methods

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Objective

Evaluating geriatric emergency department (GED) interventions requires accurate longitudinal identification of GED sites and reliable linkage to hospital-level data, yet identifiers are often incomplete, inconsistent, or change over time. Our objective was to construct longitudinal GED identifiers by reconciling publicly available GED accreditation lists in the United States (US) linked to hospital characteristics in the American Hospital Association (AHA) survey.

Conclusions

Accurate GED-AHA linkage is achievable, though sensitive to identifier instability, naming variation, and longitudinal changes.

Approach

GED accreditation lists were first affirmed as GEDs and newly accredited GEDs using a two-stage fuzzy matching approach blocked by state. Sites were initially matched using hospital name similarity (distance ≤ 0.15), followed by city-based matching for remaining unmatched sites (distance ≤ 0.10). GEDs were then linked 1:1 to the AHA survey by manually assigning the AHAIID using name and city. Discrepancies were resolved through multi-reviewer adjudication informed by geographic context, producing a curated reference linkage set of GEDs. In parallel, an XGBoost classifier paired GED sites with AHA hospitals in the same state using similarity features (name, city, teaching, rurality, and year difference) to independently reproduce curated linkages.

Results

Among 545 US GEDs between 2018-2025, 482 had AHAIIDs and 63 were missing. XGBoost reproduced 90% (95% CI: 87.8-92.5%) of curated linkages, with name similarity and city agreement accounting for over 85% of model importance by gain. Common challenges included name changes, system-level identifiers spanning multiple campuses, and accreditation turnover (sites gaining or losing accreditation).

