

Structural Characteristics of a Tuberculosis Case Network for Public Health Decision-Making

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Abstract

Tuberculosis (TB) remains a considerable public health concern, especially in metropolitan areas where frequent interactions elevate the risk of transmission. Epidemiological studies often focus on individual characteristics but may overlook relational structures associated with infectious disease dynamics. This study examines the structural features of a tuberculosis case network using complex network analysis within a public health decision-support perspective. The proposed network structure represents confirmed tuberculosis cases as nodes and shared contextual attributes as edges, indicating similarity-based potential transmission pathways. Density, average degree, clustering coefficient, path length, and centrality measures are used to evaluate network structure. These metrics characterize connectivity patterns and structurally significant positions within the network. The analysis indicates that the TB case network displays heterogeneous connectivity and localized clustering, revealing a non-random structural organization. Centrality-based results suggest that a limited number of cases occupy structurally influential positions within the network. These findings emphasize the importance of evaluating relational structures alongside individual risk factors when analyzing TB transmission dynamics. The framework is demonstrated using an anonymized retrospective tuberculosis registry dataset. The findings illustrate how network-based representations of epidemiological data can support decision-making processes by identifying structurally significant cases and connectivity patterns in urban tuberculosis control contexts.

Keywords

Network Analysis, Complex Networks, Tuberculosis, Public Health, Decision-Making.

Biography

Ece Arzu Yıldız is an Assistant Professor of Industrial Engineering at Gazi University, Ankara, Türkiye. She received her BSc and MSc degrees in Industrial Engineering from TOBB University of Economics and Technology, and her PhD in Industrial Engineering from Gazi University. Her research interests include optimization theory and methods, discrete-event simulation, supply chain and logistics management, and network design. Her research focuses on the development of mathematical models and analytical approaches for addressing complex decision problems in engineering systems.