Insights into the spatial epidemiology of Hepatitis C infection: Systematic synthesis of Area-Level Determinants and Spatiotemporal Analyses

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Area-level determinants significantly shape the risk environment for HCV infection, with socioeconomic factors emerging as a central theme in contemporary HCV epidemiological research

BACKGROUND

Hepatitis C virus (HCV) stands at the forefront of global elimination endeavors by 2030. Effective elimination necessitates a comprehensive investigation into the disparities and vulnerabilities of diverse communities through an innovative spatial epidemiological lens.

This systematic review sought to synthesize the area-level determinants of HCV infection elucidated in extant literature and summarize the application of spatial and spatiotemporal analyses in hepatitis C research.

METHODS

Following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, a comprehensive search of peer-reviewed literature from the period 2000 to 2023 was performed using the PubMed, Web of Science, Scopus, and Embase databases.
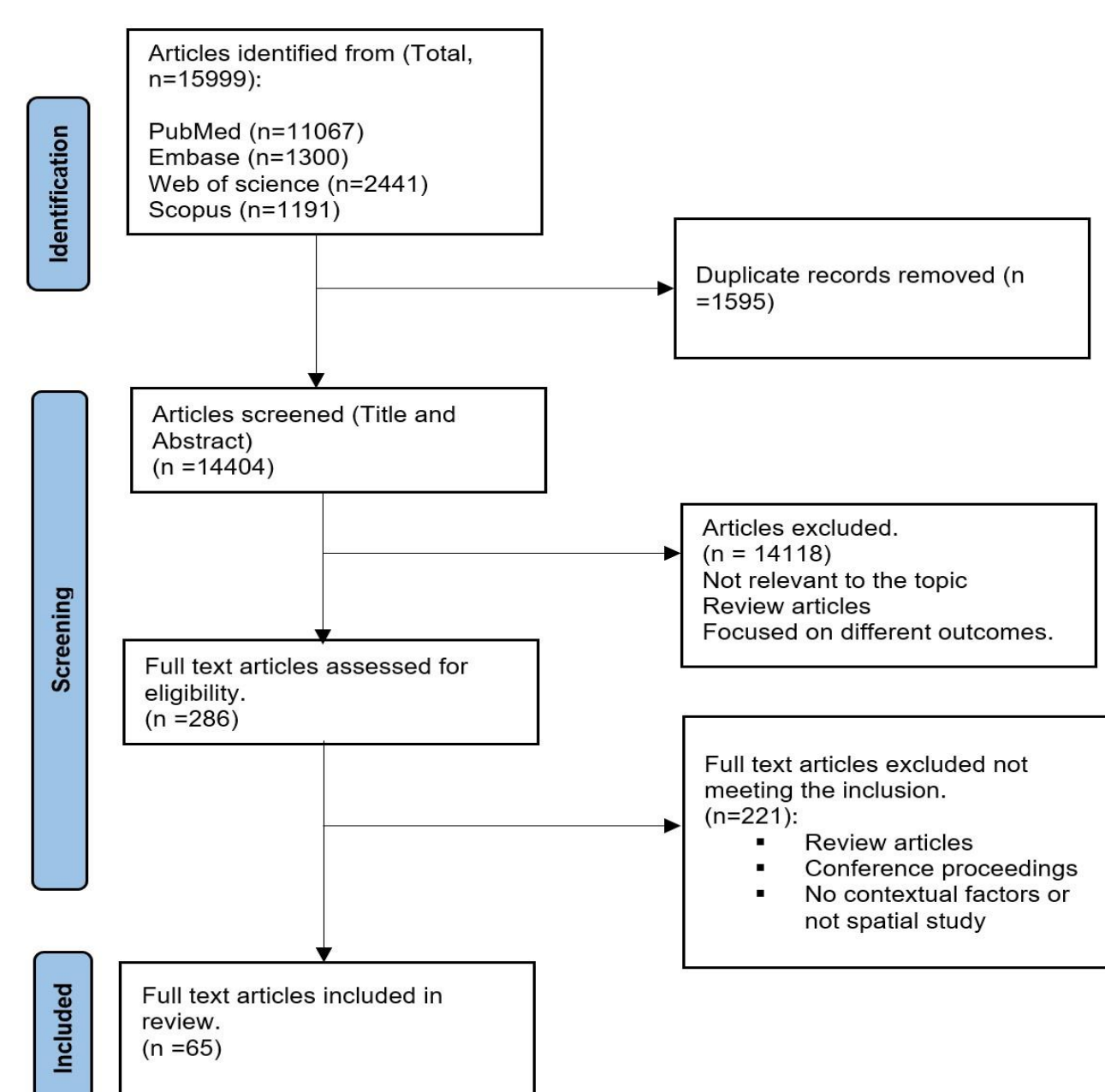

Flow chart of selected studies

RESULTS

| Category	Number of Studies (total=65)	%
Study design		
Cross-sectional	61	93.8
Cohort/longitudinal	4	6.2
Study population		
The general population	39	60.0
People who inject drugs	13	20.0
WHO regions		
African	3	4.6
Americas	31	47.7
European	6	9.2
South-East Asia	2	3.1
East Mediterranean	4	6.2
Western Pacific	19	29.2
Level of analysis		
Individual	5	7.7
Ecologic	46	70.8
Multilevel	14	21.5
Geographic unit of aggregation		
County	14	21.5
Province	7	10.8
ZIP code	3	4.6
District	5	7.7
Census tract	7	10.8
HCV-related outcome		
Prevalence (seroprevalence)	30	46.2
Incidence	22	33.8
Mortality rate	3	4.6

Summary characteristics of the selected studies

RESULTS CONTINUED
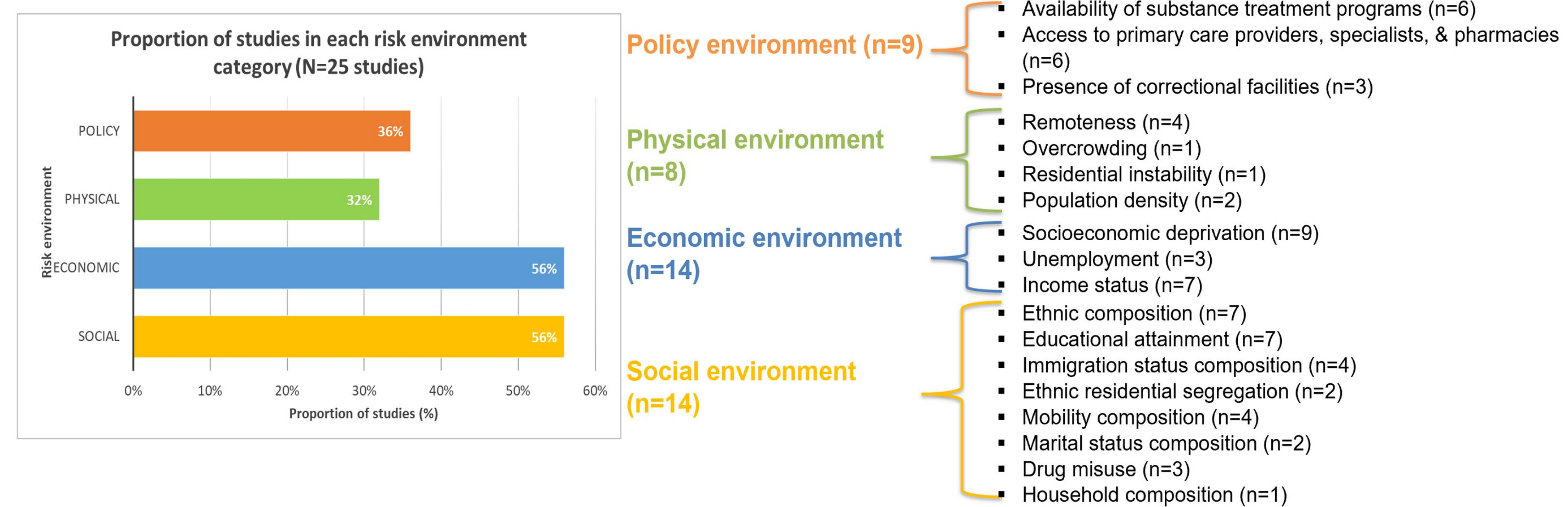
Summary of the area-level factors highlighted in hepatitis C studies: categorized according to the risk environment type.

- *25 studies out of 65 reported area-level factors of importance in hepatitis C-related outcomes.*
- *The predominantly explored area-level factors were characteristics of the social and economic risk environments.*
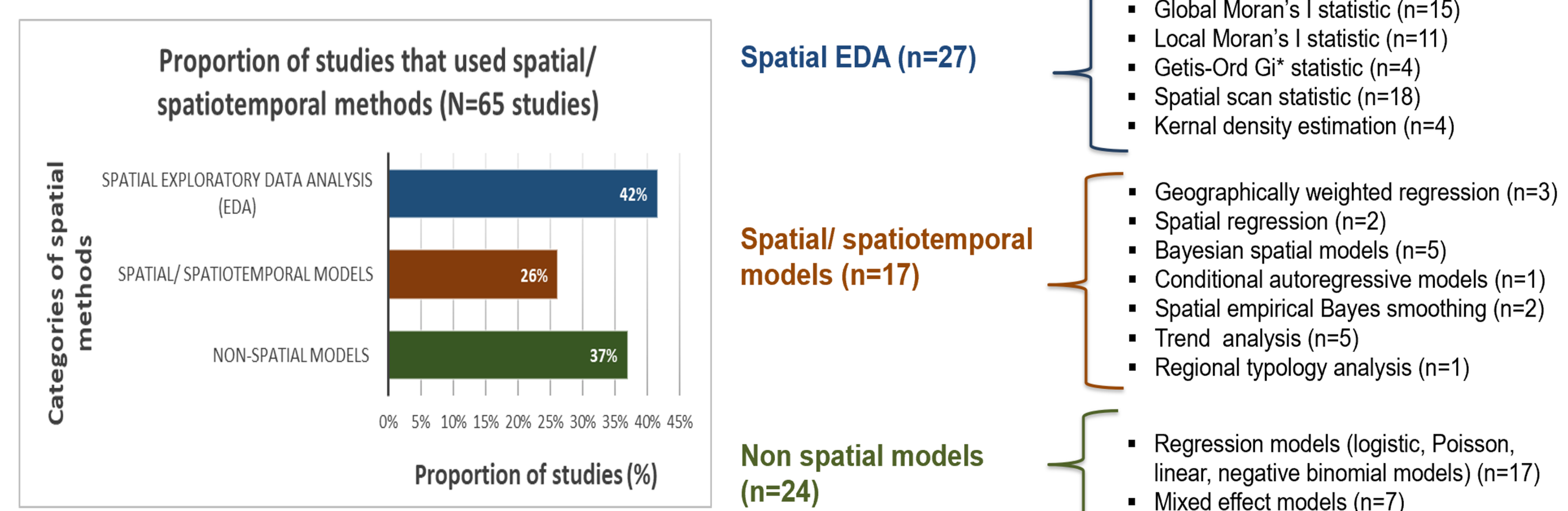
Summary of geospatial and non-spatial methods applied in hepatitis-C-related

- *Spatial exploratory data analysis (EDA) methods were the predominantly employed methods.*
- *The application of spatial EDA methods was primarily for visualizing and exploring patterns of HCV occurrence.*
- *Spatial and spatiotemporal models were less commonly utilized in the analysis of HCV data. When employed, these models were mainly used to investigate area-level determinants of HCV occurrence and small-area disease estimation.*

CONCLUSIONS

- The findings underscore the crucial importance of unraveling the intricate interplay of area-level factors in shaping the risk environment of HCV infection.
- A comprehensive understanding of the potential risk environment landscape of HCV could assist in identifying vulnerable areas and communities, thus facilitating targeted interventions aimed at eliminating HCV.
- The underutilization of geospatial models in HCV research underscores a notable methodological gap that warrants attention, particularly because they are significant in informing geographically targeted public health interventions.

ADDITIONAL KEY INFORMATION

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