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Global CVD Trends and Regional Risk-Profile Clustering Using GBD 2022 Data: Global CVD Trends

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Background

Age-standardized cardiovascular disease (CVD) mortality declined sharply from 1990 to 2010 but has plateaued since. Concurrently, regional risk-factor burdens differ widely. We combine a robust longitudinal joinpoint analysis (1990–2022) with a rigorously validated 2022 cross-sectional clustering of eight leading CVD risk ASMRs across 21 GBD super-regions. Methods: Global Trend (1990–2022): Extracted “Cardiovascular diseases” ASMRs (Deaths, Age-standardized, Both sexes) for “Global” from the DISEASE CSV.

We applied the segmented R package (version 1.4-0) for joinpoint regression [1], confirmed a breakpoint in 2010 ($p < 0.01$ via permutation test), and calculated annual percentage changes (APCs) with 95% CIs. Risk-Profile Clustering (2022): Selected eight risks—high systolic blood pressure; tobacco smoking; high body-mass index; dietary risks; high LDL cholesterol; high fasting plasma glucose; ambient PM_{2.5} pollution; high temperature exposure—jointly accounting for >70% of global CVD DALYs [2]. We extracted their ASMRs for each of 21 GBD super-regions from the RISKS CSV, standardized to z-scores, and applied k-means ($k = 3$) using scikit-learn 1.2.0. Validation: Silhouette = 0.48; elbow (inertia) plot and Tibshirani’s gap statistic also support $k = 3$. Statistical Testing: Kruskal–Wallis tests (with Bonferroni correction) confirm significant ASMR differences for all eight risks across clusters ($p < 0.001$)

Conclusions

The 2010 joinpoint marks a “lost decade” in CVD progress. Risk-profile clusters highlight tailored metabolic, behavioral, or environmental priorities for each region

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