Applying the County Health Rankings Model to Identify Priorities for Cancer Prevention and Control Interventions

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1. Background
The County Health Rankings (CHR) Model includes four major Health Factors (health behaviors, clinical care, social and economic factors, and physical environment) and was developed to provide a framework for prioritizing health-related investments including setting agendas, implementing policies, and sharing resources for improving community health and health equity. The CHR Model may be utilized to inform approaches to reduce cancer incidence and mortality, however, data analysis guided by the CHR Model for cancer outcomes has not been reported.

2. Goals
The aim for this project is to describe the associations between metrics based on the CHR Model and county-level cancer incidence and mortality rates for Wisconsin, a state with a large rural population. Incidence and mortality rates are investigated for all cancers combined, as well as breast, prostate, lung, and colorectal cancers.

3. Solutions and Methods
Using county-level publicly available data, Health Factor summary scores were derived for determinants of health in four areas: health behaviors (e.g., smoking, obesity), clinical care (e.g., health insurance, vaccination), social and economic factors (e.g., education, income), and physical environment (e.g., air pollution). A composite Health Factor z-score was calculated as the weighted (30%, 20%, 40%, and 10%, respectively) average of the four Health Factor summary scores among all U.S. counties.

Wisconsin's 72 counties were clustered by z-scores using k-means clustering into unequally sized groups ranging from least to most healthy factors, or community conditions (z-scores are inversely related to Health Factors, where lower z-scores are better). We fit age-adjusted negative binomial regression models with the Health Factor groups as the predictor variable and cancer incidence and mortality rates as the outcome to estimate rate ratios (RR) and 95 percent confidence intervals (CI).

4. Outcomes
Compared to the 13 Wisconsin counties grouped in the "healthiest" community conditions, the 19 counties grouped among the "least healthy" community conditions had elevated incidence of overall cancer (RR 1.09, CI 1.00-1.19), lung cancer (RR 1.43, CI 1.28-1.59), and colorectal cancer (RR 1.18, CI 1.06-1.31), but not breast (RR 0.93, CI 0.86-1.01) or prostate cancer (RR 1.02, CI 0.88-1.18). The counties grouped among the "least healthy" also had higher rates for overall cancer mortality (RR 1.28, CI 1.19-1.37), and mortality from prostate (RR 1.17, CI 1.03-1.33), lung (RR 1.76, CI 1.45-2.13), and colorectal cancers (RR 1.34, CI 1.18-1.53).

5. Lessons Learned and Future Directions
The CHR Model may help to inform approaches to improve cancer outcomes and promote cancer equity. In the future, we will replicate this approach to consider other types of cancer, predictor data, geographic areas, and population groups. By applying the CHR Model to cancer data, we can inform

decisions regarding community-level priorities for cancer prevention and control interventions based on actionable steps.