Exploring Social, Environmental, and Health Correlates of Liver & IBD Cancer Incidence in the HMNCC Catchment Area

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Objectives

- Measure key associations between social, health, and environmental factors and liver & IBD cancer incidence.
- Identify disparities by comparing liver & IBD cancer rates across demographic and geographic groups within the HMNCC catchment area.

HMNCC Catchment Area
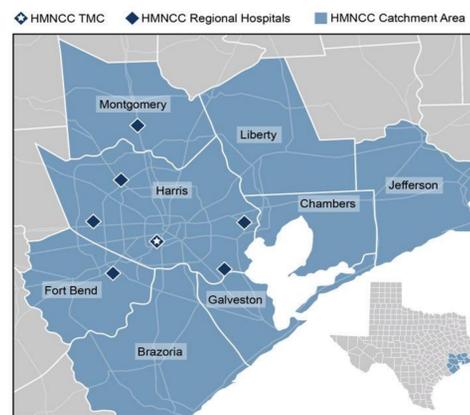
Background

- Liver and intrahepatic bile duct (IBD) cancer presents a significant burden in the Houston Methodist Neal Cancer Center (HMNCC) eight-county catchment area, marked by profound geographic and racial disparities that threaten health equity.
- This region exhibits stark variations in demographics, health resource access, and notably, industrial exposures with several counties experiencing disproportionate petrochemical industry presence.
- Community Advisory Board members and community partners have repeatedly raised concerns about these environmental exposures and their potential health impacts.
- Responding to these community-identified priorities, we collaboratively examined the intersection of industrial emissions, social vulnerability, and cancer burden within the catchment area.

Demographics and Cancer Burden

Indicator	HMNCC	TX	US
Hispanic or Latino (any race)	38%	39%	18%
Non-Hispanic Black/African American	20.6%	12%	13%
Non-Hispanic Asian	9%	4%	5%
Living in poverty (<200%)	31%	34%	30%
Obese (≥30 kg/m²)	37%	35%	33%
Uninsured	19%	17%	9%
Less than high school graduate	15%	16%	12%
Liver/IBD cancer incidence (age-adjusted)	13.1†	12.6*	8.6*
Liver/IBD cancer mortality (age-adjusted)	9.3†	8.5*	6.6*

† Source: Cancer In Focus. Cancer rates (cases per 100,000 population per year) are age-adjusted to the 2000 US standard population. Incidence rates calculated using US Cancer Statistics 2018-2022. Mortality rates calculated using NCHS 2019-2023.
*Source: State Cancer Profiles (CDC/NCI). Cancer rates (cases per 100,000 population per year) are age-adjusted to the 2000 US standard population. Rates calculated using SEER*Stat. Population counts for denominators are based on Census populations as modified by NCI.

Methods

Data Sources
United States Cancer Statistics (USCS, 2018-2022)
CDC PLACES (2024)
ACS 5-Year Estimates (2019-2023)
GIS Mapping

Variables
County-level cancer incidence
Sociodemographic factors
Clinical & behavioral factors
Environmental factors

Counties
Harris, Montgomery, Fort Bend, Galveston, Brazoria, Chambers, Liberty, and Jefferson

Statistical Analyses
Weighted Spearman correlations
Weighted univariate linear regressions of log-transformed incidence
Holm adjustment for multiple testing

Results

13.5	**9.27 – 16.74**	**3**
per 100,000 Population-Weighted Median Incidence	per 100,000 County-Wide Rate Range	Counties with Elevated Incidence (Liberty, Galveston, Brazoria)

Weighted Spearman Correlations with Liver Cancer Incidence
Significance based on Holm-adjusted p-values

Significance
--- Not Significant
--- Significant (Holm p < 0.05)

Positive Correlations
(Higher values = Higher incidence)

High blood pressure	r = 0.974 *
AIAN population	r = 0.972 *
SVI housing	r = 0.775

* Significant after Holm adjustment

Negative Correlations
(Higher values = Lower incidence)

1000/100 Mbps Broadband	r = -0.965 *
Advanced degree	r = -0.963 *
College education	r = -0.747

* Significant after Holm adjustment

Results: Weighted Univariate Regression

Factor	β	p-value
SVI Housing	0.747	0.011
Median Gross Rent	-0.0008	0.016
Median Home Value	-0.000	0.017
Economic Segregation	-1.30	0.020
College Education	-1.82	0.022

Social vulnerability index housing showed the strongest association with liver & IBD cancer incidence, underscoring the link between housing instability and cancer burden.

Implications

Liver & IBD cancer incidence clusters geographically within the catchment, with Liberty, Galveston, and Brazoria counties showing consistently elevated rates aligned with social vulnerability and environmental exposure indicators.

Social vulnerability index housing emerged as the strongest predictor of incidence (β=0.747, p=0.011), indicating that housing instability and socioeconomic disadvantage are key population-level drivers of liver cancer burden.

Strong inverse associations with broadband access and educational attainment suggest that counties with fewer resources and lower connectivity bear a disproportionate cancer burden, pointing to structural determinants of health.

Hispanic residents experience the highest race-specific burdens, warranting further investigation into the intersection of ethnicity, environmental exposures, and liver cancer risk to inform targeted screening and early detection strategies.

Future Direction

Across the HMNCC catchment, liver & IBD cancer incidence clusters geographically and aligns closely with modifiable and non-modifiable risk indicators.

Priority areas for continued investigation include:

- Expanding longitudinal analysis to track temporal trends in cancer incidence and social determinants
- Deeper examination of petrochemical exposure pathways and their association with liver cancer
- Multilevel modeling incorporating individual, neighborhood, and county-level factors
- Strengthening community-based participatory research partnerships to ensure findings drive equitable interventions

Acknowledgements

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