Evaluating Early-Onset Colorectal Cancer Incidence Trends and Geographic Disparities Among Adults Aged 20-50 in Michigan

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Background

- Early-onset colorectal cancer (EOCRC), defined as a diagnosis before age 50, represents a growing public health challenge.[1]
- National incidence rates for adults aged 20-49 nearly doubled in recent decades.[1,3]
- Despite these trends, current colorectal cancer screening guidelines begin at age 45, potentially missing at-risk individuals under45.[6,7]
- Over 60% of EOCRC cases are present at advanced stages, resulting in higher treatment costs and worse prognosis.[1,2]
- Limited data exists on geographic disparities in EOCRC incidence at the state and local levels.[1,5]

Objective

- To evaluate EOCRC incidence trends among Michigan adults aged 20-50 and identify ZIP-code level geographic disparities in incidence rates using publicly available surveillance data.[1–5]

Methods

- A retrospective population-based cohort study was conducted utilizing publicly available Michigan Cancer Registry data, SEER*Explorer, and NIH State Cancer Profiles from 2006-2020.[1–5]
- Adults aged 20–50 with colorectal cancer (ICD-10 codes C18.x, C19, C20) will be included in the analysis if they meet the following criteria:
  1) Diagnosed within the specified age range during the study period.[1,2]
  2) have complete demographic and staging information. [1,2]
  3) have valid ZIP code data for geographic analysis. [1,2]
  4) Individuals diagnosed before age 20 or after 50 were excluded. [1,2]
- Analyses focused on ZIP code level incidence variation using spatial analysis techniques.[5]
- Age-adjusted incidence rates were calculated per 100,000 population.[1-3]
- Geographic Information Systems (GIS) mapping will be used to identify spatial clusters and disparities.[5]
  - National incidence figures were used for benchmarking.*[3,4]
- Chi-square tests and spatial autocorrelation analysis will be used to assess statistical significance of geographic disparities.[1,5]

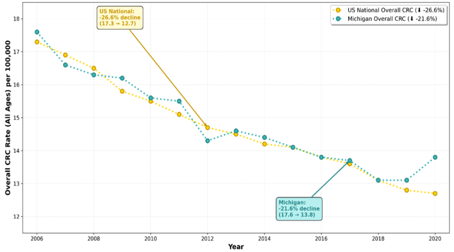
Results

Table 1. Patient Demographics and Disease Characteristics (2006–2020)

Characteristic	Overall
Patient Demographics (N=9218)	
Age at Diagnosis (years)	
15–19	28 (0.3%)
20–24	101 (1.1%)
25–29	221 (2.4%)
30–34	535 (5.8%)
35–39	1134 (12.3%)
40–44	2618 (28.4%)
45–49	4581 (49.7%)
Gender	
Female	4305 (46.7%)
Male	4913 (53.3%)
Race / Ethnicity	
Non-Hispanic White	6010 (65.2%)
Non-Hispanic Black	1724 (18.7%)
Hispanic (any race)	839 (9.1%)
Asian / Pacific Islander	535 (5.8%)
American Indian / Alaska Native	111 (1.2%)
Stage at Diagnosis	
Localized	2166 (23.5%)
Regional	3669 (39.8%)
Distant	3383 (36.7%)
Geography	
Rural ZIP Code	1171 (12.7%)
Urban ZIP Code	8047 (87.3%)
Temporal Distribution (Year of Diagnosis)	
1990–1999	793 (8.6%)
2000–2009	3272 (35.5%)
2010–2021	5153 (55.9%)

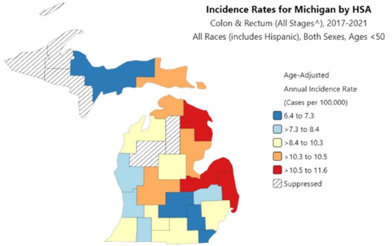
- A total of 9,218 EOCRC cases were identified in Michigan between 2006–2020.
- Majority of diagnoses occurred in adults aged 40–49 years.
- Over 60% of patients presented with advanced disease (Stage III or IV) at diagnosis.
- A greater proportion of cases occurred in urban ZIP codes, suggesting environmental or access-related disparities

Figure 2. EOCRC incidence rates ages < 50 (2006–2020)



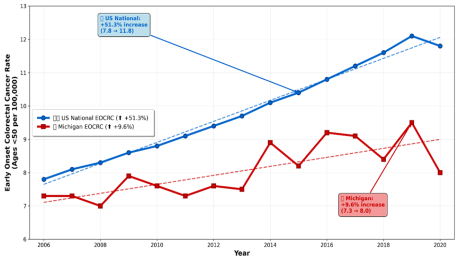
- Michigan's EOCRC rate increased by 9.6% (from 7.3 to 8.0 per 100,000).

Figure 1. Geographic Distribution of EOCRC Incidence by ZIP Code (2006–2020)



- Significant ZIP-code level variation observed across Michigan.
- Higher incidence rates concentrated in urban and industrial areas (e.g., Detroit Metro, Flint, Grand Rapids).
- Spatial clustering patterns suggest localized disparities in screening, risk exposure, and healthcare access.

Figure 3. Trends in EOCRC incidence rates ages < 50 (2006-2020)



- The US national EOCRC rate increased by 51.3% (from 7.8 to 11.8 per 100,000), while Michigan's rate increased by 9.6% (from 7.3 to 8.0 per 100,000).

Limitations

- The study relied on publicly available aggregate data, limiting individual level risk factor analysis.[1,2]
- Retrospective design prevented assessment of causality between geographic location and cancer incidence.[1,5]
- Data completeness varied across ZIP Codes, with some areas having suppressed data due to small case numbers.[1,2]
- Study period ended in 2020, potentially missing recent trends influenced by COVID-19 pandemic related healthcare utilization changes.[4]
- ZIP code level analysis may mask important within area variations in EOCRC incidence.[5]

Conclusions

- This study confirms a significant and rising burden of early-onset colorectal cancer (EOCRC) in Michigan's younger population, highlighting substantial geographic disparities.[1,2,5]
- These findings emphasize the need to explore interventions that may enhance early detection and improve outcomes, particularly in high-incidence geographic areas.[6,7]

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Acknowledgements

This study was conducted as part of the AMCP Foundation/Pfizer Inc. Oncology Managed Care Internship Program in collaboration with Priority Health. The authors would like to thank Ebony Clay and Anne Fentress for their mentorship and continued support throughout the project.