# Racial Differences in Stage IV Colorectal Cancer Molecular Profiling and Mutation Rates

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## INTRODUCTION

- Colorectal Cancer (CRC) is 3rd most common and 3rd most fatal cancer in United States[1]
- Eastern North Carolina (ENC) has been identified as a "hotspot" for increased CRC mortality, with an established racial disparity
  - metastatic CRC mortality: Black 8.3%, 95% CI 7.4%-9.2% vs White 5.6%, 95% CI 5.1%-6.1%)[2]
- Molecular and genetic testing for microsatellite instability (MSI), KRAS, and BRAF introduced into National Comprehensive Cancer Network (NCCN) guidelines[3,4]
  - KRAS 2009, BRAF and MSI 2015
- Racial disparities in treatment and mutation rates have been demonstrated[5,6]

- Study Aims: (1) evaluate differences in molecular testing rates over time by race and (2) compare the prevalence of tumor mutations by race in patients with metastatic CRC

## MATERIALS & METHODS

- Retrospective cohort study of all adult patients diagnosed with stage IV CRC between 2008-2018 within ECU/Vidant Hospital Cancer Registry
- Demographic/clinical characteristics collected through primary data abstraction of electronic health record (EHR)
- Molecular testing results obtained from Caris Molecular Intelligence or EHR

- *Statistical Analysis*: Chi-square test of significance for demographic characteristics and mutation rates, locally weighted smoothing scatter plot-smoothing curves and binary multivariable logistic regression models to compare trends in testing rates

## RESULTS

Figure 1: Flow diagram illustrating the exclusion criteria and eventual cohort selection

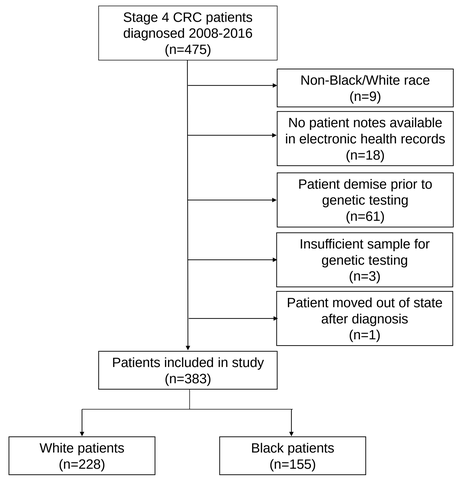
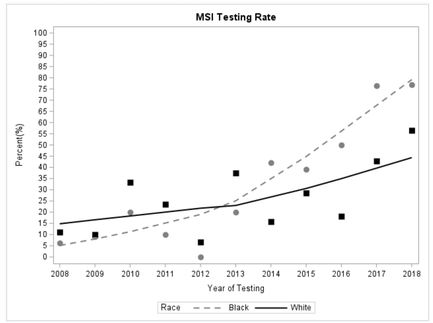



Table 1. Socio-demographic and clinical characteristics of patients of CRC patients by race, 2008-2018.

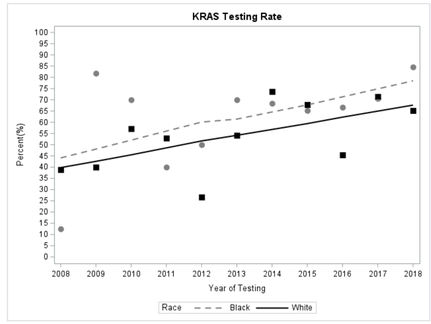
| | Black (n=155) | | White (n=228) | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Sex | | | | | 0.08 |
| Male | 73 | 47.1% | 128 | 56.1% | |
| Female | 82 | 52.9% | 100 | 43.9% | |
| Age at diagnosis (years) | | | | | 0.29 |
| < 50 | 23 | 14.8% | 31 | 13.6% | |
| 50-59 | 42 | 27.1% | 47 | 20.6% | |
| 60-69 | 45 | 29.0% | 68 | 29.8% | |
| 70-79 | 33 | 21.3% | 50 | 21.9% | |
| ≥ 80 | 12 | 7.7% | 32 | 14.0% | |
| Charlson Comorbidity Index | | | | | 0.19 |
| 0 | 63 | 40.6% | 108 | 47.4% | |
| 1 | 48 | 31.0% | 49 | 21.5% | |
| 2 | 18 | 11.6% | 33 | 14.5% | |
| ≥ 3 | 26 | 16.8% | 38 | 16.7% | |
| Tobacco Use | | | | | 0.003 |
| Yes | 63 | 40.6% | 111 | 48.7% | |
| No | 76 | 49.0% | 75 | 32.9% | |
| Unknown | 16 | 10.3% | 42 | 18.4% | |
| Annual household income | | | | | <0.001 |
| < $30,000 | 4 | 2.6% | 4 | 1.8% | |
| $30,000-39,999 | 88 | 56.8% | 75 | 32.9% | |
| $40,000-49,999 | 40 | 25.8% | 96 | 42.1% | |
| ≥ 50,000 | 23 | 14.8% | 53 | 23.2% | |
| Residence | | | | | 0.65 |
| Urban | 63 | 40.6% | 98 | 43.0% | |
| Rural | 92 | 59.4% | 130 | 57.0% | |
| Tumor location | | | | | 0.70 |
| Right colon | 62 | 40.0% | 100 | 43.9% | |
| Left colon | 53 | 34.2% | 74 | 32.5% | |
| Rectum | 27 | 17.4% | 41 | 18.0% | |
| Other/indeterminant | 13 | 8.4% | 13 | 5.7% | |
| Tumor pathology | | | | | 0.13 |
| Adenocarcinoma | 133 | 85.8% | 187 | 82.0% | |
| Signet ring | 5 | 3.2% | 19 | 8.3% | |
| Other/indeterminant | 17 | 11.0% | 22 | 9.6% | |

Figure 2A-C: Molecular testing rates by race. Solid lines are LOESS smoothing curves. (A) Microsatellite instability (B) KRAS (C) BRAF.

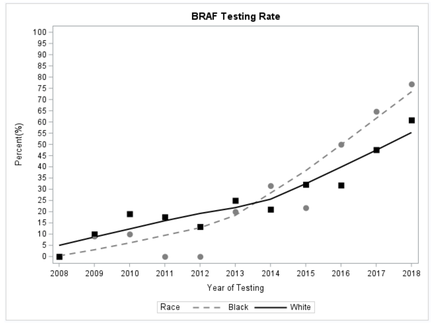
A




B

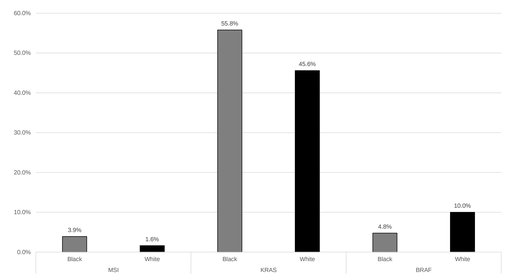



C




- Between 2008-2018, 32.8% of Black patients and 41.2% of white patients had no molecular testing (p=0.21)
- Odds of MSI testing increased for both groups, dependent on race (0=0.005)
  - White 26% per year (OR 1.26, 95% CI 1.12-1.41) vs Black 69% per year (OR 1.69, 95% CI 1.41-2.02)
- Odds of KRAS testing increased over study period (p<0.0001), independent of race (p=0.58)
- Odds of BRAF testing increased for both groups, dependent on race (p=0.027)
  - White 42% per year (OR 1.42, 95% CI 1.26-1.62) vs Black 89% per year (OR 1.89, 95% CI 1.51-2.36)

Figure 3. Rates of Microsatellite Instability (MSI-H), *KRAS* mutations, and *BRAF* mutations by race, 2008-2016.




MSI-H: p=0.46
KRAS: p=0.13
BRAF: p=0.33

## DISCUSSION

- Molecular testing rates for stage IV CRC patients increased over time for both Black and White patients, consistent with NCCN guidelines
- Molecular testing is an integral part of CRC treatment as results can influence treatment options [7,8]
- Of the patients tested, there was no significant difference between MSI-H, *KRAS*, or *BRAF* mutation rates
- Aggressive tumor mutations do not seem to be driving force behind increased CRC mortality for black patients in ENC
- Limitations: retrospective study, small sample size, Hispanic patients not separately identified
- Strengths: high Black population 40%, rural population

- Next steps: examine treatment rates of ENC patients, overall and stratified by race

## REFERENCES

## ACKNOWLEDGEMENTS

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