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RESEARCH ARTICLE

Does Community Affluence Improve Survival of Colorectal Cancer?

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Introduction: Colorectal cancer is the second most common cause of cancer-related death in the U.S. Lower SES and lack of health insurance coverage are 2 known risk factors for lower colorectal cancer survival. The primary objective of this research is to evaluate the survival rates of patients diagnosed with colorectal cancer who reside in an affluent suburb and to examine factors that may impact mortality.

Methods: Information was collected from the Stony Brook Cancer Center registry for all cases of colorectal cancer diagnosed between 2010 and 2020. The Distressed Community Index, a proxy for SES based on geographic location and data obtained from the U.S. Census, was paired with patient ZIP codes to evaluate the impact of prosperity on survival. Chi-square tests, Kaplan−Meier survival curves, and hazard ratios are presented.

Results: Among 946 patients with colorectal cancer, more than half resided in a prosperous (Distressed Community Index ≤ 20) ZIP code. Age and sex were similar between Distressed Community Index groups; however, a significant association was found between Black race and Distressed Community Index score >20 ($p<0.01$). Patients who were married were more likely to live in a prosperous ZIP code ($p<0.01$), whereas those with Medicaid health insurance were more likely to reside in a nonprosperous community ($p<0.01$). More than 75% of cases were diagnosed at Stage 2 or higher, and survival rates at 1 year and 5 years were 84.6% and 59.2%, respectively. Stage at diagnosis and overall survival were not associated with Distressed Community Index status. Older age (≥70 years) (hazard ratio=2.43, 95% CI=1.18, 5.01) and late stage at diagnosis (hazard ratio= 12.24, 95% CI=6.86, 21.81) were found to be associated with increased mortality at 5 years.

Conclusions: In this relatively affluent study population from a tertiary care facility registry, improved survival rates among patients with colorectal cancer were not observed compared with national averages. Advanced stage of diagnosis and older age increased mortality in persons with colorectal cancer. Because early detection remains one of the most important tools for improving survival outcomes, efforts to increase screening education and reduce barriers as well as address challenges with screening adherence would likely benefit the population at risk, irrespective of community prosperity.

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INTRODUCTION

Colorectal cancer (CRC) is the third leading cancer diagnosed in the U.S. and the second most common cause of cancer-related death.[1] The lifetime risk of developing CRC is estimated to be 1 in 26 (4.0%) for women and 1 in 23 (4.3%) for men, with 52,550 related deaths expected this year.[1] Among known risk factors for CRC, lower SES and lack of health insurance coverage have been implicated as key contributors to reduced survival,[2,3] with neighborhood-level disadvantage associated with worse outcomes even after adjustment for patient-level low income.[4] Although impoverishment has been shown to negatively influence survival, it remains unclear whether higher SES alternatively yields optimal outcomes.

In Suffolk County, New York (NY), cancer is the second leading cause of death,[5] and the region bears a disproportionately high burden of cancer compared with the U.S. (18% higher incidence) and New York State (NYS) (10% higher incidence). This includes an 8% higher incidence rate for Suffolk than the U.S. and New York for CRC.[6] Overall, age-adjusted cancer mortality rates per 100,000 in Suffolk County are 7.3% lower than the U.S. rates and 1.5% higher than the NYS rate (139.2 for Suffolk vs 137.1 for NYS). The age-adjusted mortality rate per 100,000 for CRC is 9.2% lower in Suffolk than the U.S. rate and about the same as the NYS rate (12 for Suffolk vs 11.9 for NYS).[6]

Suffolk County, NY, is a relatively prosperous community of 1.5 million residents with a median household income of $111,660 annually.[7] Health insurance coverage rates are also reported to be greater in Suffolk than the national average,[8–10] yet despite these increased SES indicators, incidence rates of CRC in the county are higher than the state average,[11] and the mortality rates in Suffolk are similar to the state average.[6] During 2015–2019, age-adjusted incidence rates for CRC per hundred thousand were 40.6 (95% CI=39.3, 42.0) for Suffolk County and 37.7 (95% CI=37.4, 38.1) for NYS, whereas age-adjusted mortality rates per hundred thousand were 12.1 (95% CI=11.4, 12.8) for Suffolk and 12.2 (95% CI=12.0, 12.4) for NYS.[6] Among the 62 counties in New York, Suffolk ranks 23rd for incidence and 40th for mortality rates, yet for prosperity, the county ranks 4th highest.[6]

One might expect that the mortality rates would be lower for Suffolk, given the higher SES indicators. The reason for this paradox has yet to be elucidated, and reports related to mortality in predominantly prosperous communities are limited. The primary objective of this research is to evaluate the survival rates of patients diagnosed with CRC who reside in a relatively affluent suburb in the Northeast and to examine factors that may impact mortality in this region.

METHODS

Stony Brook Medicine is an integrated health system that includes education, research, and patient care programs. There are 5 health sciences schools; 4 hospitals, including Stony Brook University Hospital (SBUH); and >230 community-based healthcare settings throughout Suffolk County. SBUH is Long Island New York's premier academic medical center and serves as the region's only tertiary care center. SBUH is home to 4 specialty institutes, including the Stony Brook University Cancer Center (SBCC), Suffolk County's cancer care leader, and a leader in education and research. SBCC's catchment area includes Long Island's Nassau and Suffolk Counties. SBCC includes 12 multidisciplinary teams, including CRC and gastrointestinal cancer. The cancer program is accredited by the American College of Surgeons Commission on Cancer.

Study Sample

The Stony Brook Cancer Center maintains a registry that records demographic, clinical, and other information for all patients diagnosed with any type of cancer within the Stony Brook Medicine network (although treatment may have been provided at any healthcare network or provider). Because SBCC is a tertiary care referral facility, the center has been shown to treat a majority of symptomatic patients with more advanced disease rather than those presenting for screening.[12] This retrospective investigation collected information from the registry for all cases of CRC diagnosed between 2010 and 2020. Data abstracted for this study included age at diagnosis, year of diagnosis, sex, race, marital status, family history of cancer, type of health insurance, smoking status, date of last contact, American Joint Committee on Cancer stage at diagnosis, and ZIP code at the time of diagnosis.

Measures

The Distressed Community Index (DCI) is a publicly available indicator of economic well-being for geographic locations in the U.S. based on data originating from the U.S. Census.[13] The DCI is calculated from 7 metrics (no high school diploma, poverty rate, adults not working, housing vacancy rate, median household income, change in employment, and change in establishments) and provides individual scores for >26,000 ZIP codes (99% of the population). DCI values range from 0 to 100, where lower indices represent higher levels of affluence. The following quintiles are used to define welfare status: prosperous, comfortable, mid-tier, at risk, and distressed; this tool has served as a proxy for SES in some studies.[13,14] For the present investigation, patient

ZIP codes were paired with corresponding DCI scores to evaluate the impact of prosperity on survival.

Statistical Analysis

CRC cases whose primary residence was outside of Suffolk County at the time of diagnosis, those who were aged <21 years, and those diagnosed with Stage 0 cancer were excluded from this investigation. A total of 946 cases met the study's inclusion criteria, and more than half of these patients resided in prosperous neighborhoods. Because further stratification of the DCI variable did not yield statistically significant differences between subgroups, these data are presented as a dichotomized factor (scores ≤20 vs scores >20). Chi-square tests were used to evaluate potential associations between demographic and other characteristics and community affluence. The *p*-values are presented for each comparison. The 1-, 3-, and 5-year survival rates were calculated and stratified by DCI group and stage at diagnosis. The number of cases with requisite data for the survival analyses included 875 at 1 year, 680 at 3 years, and 476 at 5 years. Kaplan–Meier 5-year survival curves are presented, and log-rank tests are used to assess significant differences between groups. Cox proportional hazard models were used to evaluate the predictors of 5-year mortality. Hazard ratios (HRs) and 95% CIs are presented.

SPSS, version 21, was used to conduct these analyses. The Stony Brook University IRB approved this study (IRB Number 2021-00479), and the guidelines in the Declaration of Helsinki were upheld.

RESULTS

Of the 946 patients with CRC included in this investigation, more than half resided in a ZIP code that was classified as prosperous (DCI≤20). DCI scores ranged from 0.7 to 61.8 with a median value of 18.8 and only 4% of cases residing in a neighborhood with an index of >50. The demographic characteristics of the cases, stratified by degree of community affluence (DCI≤20 vs >20), are presented in Table 1. Although the distributions of age and sex were similar between groups, a significant association was found between Black race and DCI score >20 ($p<0.01$). In addition, cases who were married were more likely to live in a prosperous ZIP code than those who were single ($p<0.01$). Alternatively, cases who maintained Medicaid as their primary health insurance were more likely to reside in a nonprosperous community ($p<0.01$). Stage at diagnosis was not associated with DCI group in this study, and >75% of cases were diagnosed at Stage 2 or higher.

Table 2 presents the 1-, 3-, and 5-year survival rates for CRC, and Figure 1 shows the 5-year Kaplan–Meier curves stratified by DCI group. Survival rates were similar between groups at all time points. The 1-year survival rates were 84.7% and 84.4% for DCI ≤20 and >20, respectively. The corresponding rates at 5 years were 58.3% and 60.6%, respectively, with an overall 5-year survival rate of 59.2%. Figure 2 presents the 5-year Kaplan–Meier curves stratified by stage at diagnosis and indicates that survival among patients diagnosed at Stage 4 was significantly reduced compared with those diagnosed at the earlier stages (log-rank test $p\leq0.001$). The 5-year rates for Stages 1, 2, and 3 were 79.6%, 73.6%, and 68.0%, respectively, compared with 17.8% for cases diagnosed with Stage 4 disease.

Table 3 presents the Cox proportional hazard results for 5-year survival of CRC. The model indicates that older age (≥70 years) (HR=2.43, 95% CI=1.18, 5.01) and

Table 1. Demographic Characteristics of 946 Colorectal Cancer Cases Diagnosed at Stony Brook Cancer Center Between 2010 and 2020, Stratified by DCI Score

Characteristic	DCI score ≤20 (*n*=506)	DCI score >20 (*n*=440)	*p*-Value
Age, years, %			
<50	11.3	14.3	0.34
50–69	47.2	46.8	
≥70	41.5	38.9	
Sex, % male	57.1	52.0	0.12
Race, %			
Black	2.4	12.0	<0.01
White	91.9	79.5	
Other	5.7	8.4	
Marital status, %			
Single	13.2	23.5	<0.01
Married	61.9	48.5	
Separated/divorced/ widowed	24.8	28.0	
Family history of cancer, %	59.2	57.8	0.68
Smoking status, %			
Current	15.6	16.2	0.80
Former	40.8	38.6	
Never	43.6	45.2	
Insurance type, %			
Managed care	36.3	27.3	<0.01
Medicaid	9.6	20.9	
Medicare	52.5	48.6	
Self-pay/other	1.6	3.2	
Stage, %			
1	24.3	19.1	0.22
2	24.5	24.1	
3	27.1	29.3	
4	24.1	27.5	

DCI, Distressed Community Index.

Table 2. Survival Rates at 1, 3, and 5 Years, Stratified by DCI Score and Stage at Diagnosis

DCI	Stage at diagnosis				
	I	II	III	IV	All stages
DCI≤20					
1 year	95.5	89.1	93.1	59.1	84.7
3 year	84.5	77.2	77.9	35.5	68.8
5 year	78.7	70.6	65.2	16.9	58.3
DCI>20					
1 year	92.0	94.2	94.1	59.6	84.4
3 year	89.1	88.0	76.7	25.6	67.8
5 year	81.1	78.6	72.1	18.9	60.6
All cases					
1 year	94.1	91.4	93.6	59.4	84.6
3 year	86.3	82.0	77.4	30.9	68.4
5 year	79.6	73.6	68.0	17.8	59.2

DCI, Distressed Community Index.

late stage at diagnosis (HR=12.24, 95% CI=6.86, 21.81) were associated with increased mortality at 5 years. Other factors, including type of health insurance and level of community affluence (DCI score), were not found to significantly impact 5-year survival.

DISCUSSION

Although lower SES and lack of health insurance have been implicated as factors associated with increased mortality[2,3] among patients diagnosed with CRC, this does not necessarily imply that individuals residing in more prosperous communities will have optimal survival outcomes. Findings from the present investigation indicate that despite community affluence, including 97% of cases having insurance coverage, only 25% were diagnosed with localized disease. Early detection dramatically impacted survival, with 5-year rates plunging from 80% to 18% for cases diagnosed at Stages 1 and 4, respectively. Later age at diagnosis (≥70 years) and later stage at diagnosis (Stage 4) were the strongest predictors of 5-year mortality in this study, whereas type of insurance and community prosperity (DCI score) did not significantly impact survival.

5-Year Survival

The overall relative 5-year survival rate for CRC reported by the Surveillance, Epidemiology and End Results (SEER) Program for 2013−2019 was 65%.[15] Although community SES indicators in Suffolk County are higher than the national average,[7] the 5-year survival rate among cases in this study was lower (59%) than the SEER national rate. One possible explanation for the reduced survival among cases in Suffolk County may be the smaller proportion of patients diagnosed with early-stage disease. Approximately 37% of patients with CRC nationally are diagnosed with localized tumors, whereas only 21.9% of cases in this study were diagnosed with Stage 1 cancer.[16,17] This may be (at least) partially due to the reduced health status of cases being seen at SBCC, a

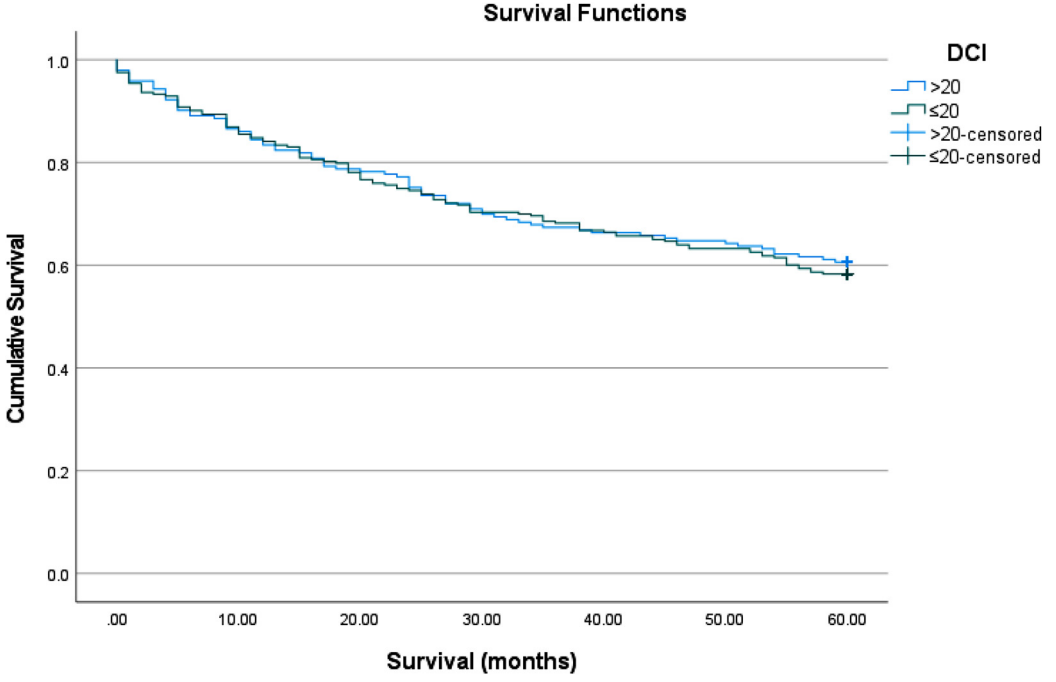

Figure 1. Overall 5-year survival stratified by DCI score. DCI, Distressed Community Index.

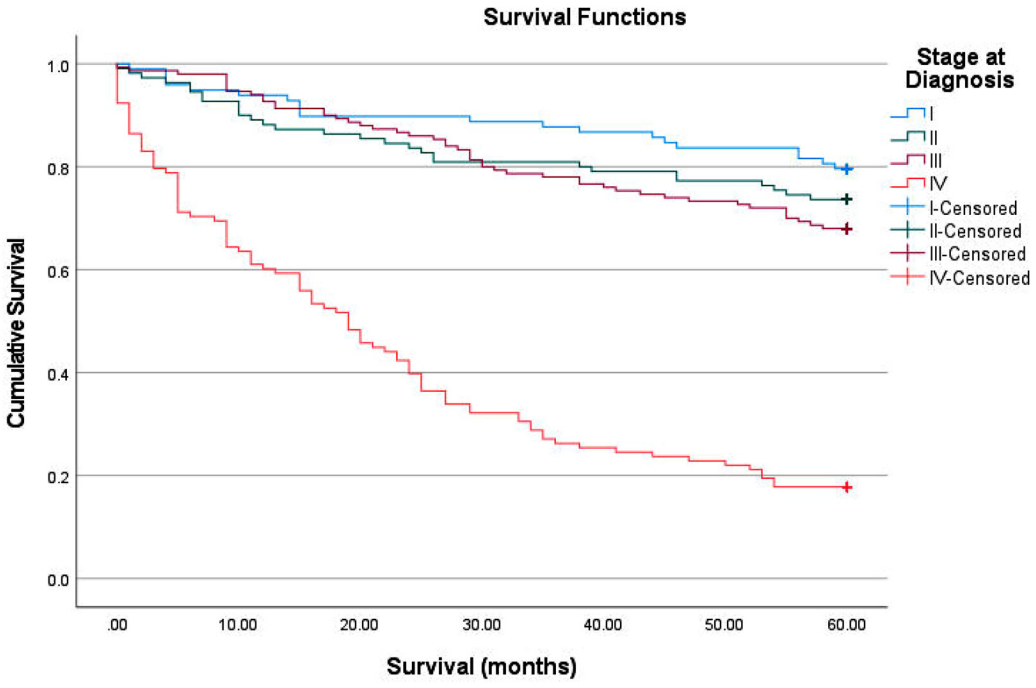

Figure 2. Overall 5-year survival stratified by stage at diagnosis.

tertiary care facility that tends to receive referrals for symptomatic patients with more advanced disease. A previous study in this patient population indicated that more than three quarters of CRC cases were symptomatic at the time of diagnosis.[12] Because it has been well established that more advanced disease yields poorer health outcomes, the later stage at diagnosis is likely to be a key contributor to the observed decreased survival in this study.[18,19]

Survival rates for CRC vary widely depending on the stage at diagnosis. National 5-year rates among patients diagnosed with localized versus those with distant metastatic disease based on SEER data were 91% and 16%, respectively.[15] Although patients diagnosed with the most advanced disease had marginally improved outcomes in the present investigation (18% vs 16%), those diagnosed at the earliest stage had lower 5-year survival rates than the national average (80% vs 91%). A total of 98 patients with 5-year data were diagnosed with Stage 1 cancer in this study. The median age of diagnosis in this group was 68 years; however, among the 20 who died during the observation period, the median age was a decade later (78 years). The limited sample size coupled with more advanced age at diagnosis among patients with localized CRC in this study may help to explain the reduced survival in this group.

Findings from the present investigation indicated that community affluence did not yield lower mortality among patients with CRC than among those residing in less prosperous neighborhoods. Instead, and on the contrary, these data indicated that despite increased rates of insurance coverage and access to high-quality health care, worse survival outcomes were noted for cases living in higher SES neighborhoods than the national averages. Thus, although low income and lack of health insurance have been shown to result in reduced survival, the opposite is not necessarily true. This study found that prosperity alone does not appear to ensure optimal outcomes.

Colorectal Cancer Screening

Although we know that there is a large percentage of people presenting with symptomatic CRC at this tertiary care facility and our sample showed a high percentage of people with late-stage cancers, perhaps there are issues with screening in Suffolk County. In 2018, it was reported that the rate of CRC screening in the U.S. was 68.8%.[20] Despite high rates of insurance coverage, prosperity, and access to quality health care, the corresponding rate in Suffolk County (60%) is lower than the national average. In addition, Suffolk maintains the third lowest rate among all counties in the state of New York.[21] Although individual screening status was not available for cases in this study, the national and state data lend support to the explanation that suboptimal survival outcomes in this relatively prosperous community are likely the result (at least in part) of reduced rates of screening.

Table 3. The 5-Year Cox Proportional Hazard Model for Colorectal Cancer

Characteristic	HR (95% CI)
Age at diagnosis	
<50 years	ref
50–69 years	1.12 (0.66, 1.93)
≥70 years	**2.43 (1.18, 5.01)**
Sex	
Female	ref
Male	1.36 (0.98, 1.89)
Race	
White	ref
Black	0.93 (0.43, 1.99)
Other	0.94 (0.47, 1.86)
Marital status	
Single	ref
Married	0.92 (0.54, 1.57)
Separated/divorced/widowed	1.45 (0.83, 2.52)
Family history of cancer	0.99 (0.71, 1.37)
Smoking status	
Current	ref
Former	0.74 (0.46, 1.19)
Never	0.80 (0.50, 1.28)
Insurance	
Managed care	ref
Medicaid	1.54 (0.88, 2.68)
Medicare	1.41 (0.80, 2.51)
Self-pay	1.48 (0.44, 4.93)
DCI score	
≤20	ref
>20	0.79 (0.56, 1.10)
Stage at diagnosis	
I	ref
II	1.57 (0.82, 2.99)
III	1.66 (0.90, 3.04)
IV	**12.24 (6.86, 21.81)**

Note: Boldface indicates statistical significance ($p<0.05$).
DCI, Distressed Community Index; HR, hazard ratio.

In 2016, it was reported that the percentage of adults who receive a CRC screening on the basis of the most recent guidelines, aged 50–64 years, was 63.1 for NYS and 49.1 for Suffolk County. In 2018, these rates were 65.4 for NYS and 65.2 for Suffolk County.[22,23]

Over the past 2 decades, rates of CRC have fallen among individuals aged ≥55 years, mainly owing to increased screening. Although there is some variation within certain age groups, there continues to be considerable concern in recent years over the rising number of cases diagnosed in patients aged <50 years.[24] In this study, 12.7% of cases were diagnosed at age <50 years, which is consistent with the national average of 12% reported in 2020.[24,25]

In 2016, the U.S. Preventive Services Task Force (USPSTF) recommended screening for CRC starting at age 50 years and continuing until age 75 years and that the decision to screen for CRC in adults aged 76–85 years should be based on the individual, accounting for the patient's overall health and prior screening history. Despite declines in incidence of CRC, it remains a cause of morbidity and mortality, and it was identified that incidence rates were declining only for those aged ≥55 years.[26] The USPSTF conducted a systematic review to update the previous review on the effectiveness, test accuracy, and harms of CRC screening as well as to inform a separate modeling report, which together were used by the USPSTF in the process of updating its CRC screening recommendation. The USPSTF concluded with high certainty that screening for CRC in adults aged 50–75 years has a substantial net benefit. The USPSTF concluded with moderate certainty that screening for CRC in adults aged 45–49 years has moderate net benefit. The USPSTF concluded with moderate certainty that screening for CRC in adults aged 76–85 years who have been previously screened has a small net benefit. Adults who have never been screened for CRC are more likely to benefit.[26] On May 18, 2021, the USPSTF changed its recommendation for CRC screening to include screening for adults aged 45–49 years in addition to those aged 50–75 years. On the basis of evidence of a small net benefit for screening in adults aged 76–85 years, the USPSTF also recommended that clinicians selectively offer screening for CRC in adults within this age range when it is appropriate in individual cases, considering the patient's overall health, prior screening history, and preferences.[27]

Limitations

Although this investigation was strengthened by the inclusion of almost 1,000 patients with CRC diagnosed over a 10-year period who reside in a relatively affluent community, thereby matching the desired demographic for evaluation, the study had several limitations. First, person-based SES indicators such as income status and level of education were not available. Although these factors would provide more detailed information at the individual level, the DCI scores enabled assessments at the neighborhood (ZIP code) level and indicated that prosperity did not have a significant impact on 5-year survival.

A second limitation of this study was the lack of data related to diet and obesity. Although prosperity may contribute to a diet rich in fruits and vegetables and access to more nutritious food and drink options, increased wealth has also been shown to result in higher food consumption and obesity, which are known risk

factors for CRC.[28–33] Thus, the directionality of the effect of such dietary factors remains unclear.

Unavailability of colorectal screening data for the cases in this study represents a third limitation of this investigation. Although we theorize (on the basis of county statistics) that lower screening rates may have contributed to the suboptimal outcomes, even among cases living in more prosperous neighborhoods, we were unable to confirm this hypothesis.

Finally, this study was based on data from a repository originating from a single institution in the Northeast, which serves a community that is not highly diverse, and, therefore, the findings may not be generalizable to other relatively prosperous regions. Furthermore, Stony Brook's Cancer Registry records all patients with any type of cancer included within the Stony Brook Medicine network; however, cases residing in the local community who are diagnosed and treated outside of the Stony Brook Medicine system are not recorded in the repository. These patients could potentially differ with regard to characteristics that might influence survival, yet it is unclear in which direction such differences would impact the outcomes. However, despite the noted limitations, the data from this study did not suggest that wealth equated to improved health outcomes among patients diagnosed with CRC. Additional research is required to more fully elucidate the primary drivers that may explain the reduced survival outcomes in this community known to have high rates of health insurance coverage and access to quality health care.

CONCLUSIONS

In this investigation, which included a relatively affluent study population, increased survival rates were not observed compared with national averages among patients diagnosed with CRC. Late stage of diagnosis and older age (>70 years) were positively associated with increased mortality. Only 25% of cases had localized disease at the time of diagnosis, which is likely the result of the referral patterns for this tertiary care hospital that receives primarily symptomatic patients for diagnosis and treatment. To fully understand the impact of prosperity on CRC incidence and mortality, further studies spanning the full continuum of cancer care from screening through survivorship would be beneficial. Additional research in diverse socioeconomic communities focused on education, reducing barriers to screening, and addressing other factors that impact screening adherence are needed to increase rates of early detection and improve overall survival.

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CREDIT AUTHOR STATEMENT

Barbara Nemesure: Conceptualization, Methodology, Formal analysis, Writing - original draft. Linda Mermelstein: Conceptualization, Data curation, Writing - review & editing. Kathleen Scarbrough: Conceptualization, Data curation, Writing - review & editing.

REFERENCES

1. American Cancer Society. Key statistics for colorectal cancer. https://www.cancer.org/cancer/colon-rectal-cancer/about/key-statistics.html. Accessed August 8, 2023.
2. Salem ME, Puccini A, Trufan SJ, et al. Impact of sociodemographic disparities and insurance status on survival of patients with early-onset colorectal cancer. *Oncologist.* 2021;26(10):e1730–e1741. https://doi.org/10.1002/onco.13908.
3. Salem ME, Trufan SJ, Symanowski JT, et al. Impact of socioeconomic status (SES) on colorectal cancer patient survival: an analysis of 890,867 patients in the National Cancer Database (NCDB). *J Clin Oncol.* 2021;39(3_suppl):19. https://doi.org/10.1200/JCO.2021.39.3_suppl.19.
4. Cheng E, Soulos PR, Irwin ML, et al. Neighborhood and individual socioeconomic disadvantage and survival among patients with nonmetastatic common cancers. *JAMA Netw Open.* 2021;4(12):e2139593. https://doi.org/10.1001/jamanetworkopen.2021.39593.
5. New York Department of Health. Table 38: Selected Causes of Death by Resident County, New York State 2017. https://www.health.ny.gov/statistics/vital_statistics/2017/table38.htm. Accessed August 15, 2023.
6. National Cancer Institute. State Cancer Profiles. https://statecancerprofiles.cancer.gov. Accessed August 15, 2023.
7. United States Census Bureau. QuickFacts. Suffolk County, New York; Nassau County, New York. https://www.census.gov/quickfacts/fact/table/suffolkcountynewyork,nassaucountynewyork,US%20/PST045219. Accessed August 15, 2023.
8. New York Department of Health. New York State community health indicator reports (CHIRS). https://www.health.ny.gov/statistics/chac/indicators/index.htm. CHIRS. Accessed 15, 2023.
9. Centers for Disease Control and Prevention National Center for Health Statistics. Health Insurance Coverage. https://www.cdc.gov/nchs/fastats/health-insurance.htm. Accessed August 15, 2023.
10. Petterson S, McNellis R, Klink K, Meyers D, Bazemore A. *The state of primary care in the United States: a chartbook of facts and statistics.* Washington, DC: Robert Graham Center; 2018. https://www.grahamcenter.org/content/dam/rgc/documents/publications-reports/reports/PrimaryCareChartbook.pdf.
11. New York State Department of Health. Cancer incidence and mortality by county and sex, 2016-2020. https://www.health.ny.gov/statistics/cancer/registry/pdf/volume1.pdf. Accessed August 8, 2023.
12. Fong C, Joseph D, Stanley S, et al. Symptomatic colorectal cancer is associated with stage IV diagnosis in two disparate populations. *Cureus.* 2022;14(9):e28691. https://doi.org/10.7759/cureus.28691.
13. Economic Innovation Group. Distressed Communities. https://eig.org/distressed-communities/. Accessed August 8, 2023.
14. Nemesure B, Scarbrough KH, Mermelstein L. Racial disparities in prostate cancer stage at diagnosis persist despite community affluence. *Res Rep Urol.* 2022;14:305–312. https://doi.org/10.2147/RRU.S371838.

15. National Cancer Institute Surveillance, Epidemiology, and End Results Program. Cancer stat facts: colorectal cancer. https://seer.cancer.gov/statfacts/html/colorect.html. Accessed August 8, 2023.
16. Cancer.Net. Stages of cancer. https://www.cancer.net/navigating-cancer-care/diagnosing-cancer/stages-cancer. Accessed August 8, 2023.
17. Cancer.Net. Colorectal cancer: statistics. https://www.cancer.net/cancer-types/colorectal-cancer/statistics#:~:text=About%2037%25%20of%20patients%20are,diagnosed%20at%20this%20regional%20stage. Accessed August 15, 2023.
18. American Cancer Society. Cancer facts & figures for African American/Black people 2022-2024. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-african-americans/2022-2024-cff-aa.pdf. Accessed August 15, 2023.
19. National Cancer Institute Surveillance, Epidemiology, and End Results Program. SEER cancer statistics review (CSR) 1975-2016. https://seer.cancer.gov/csr/1975_2016. Accessed August 8, 2023.
20. American Cancer Society. Data & progress. https://nccrt.org/data-progress/. Accessed August 8, 2023.
21. New York State Department of Health. https://www.health.ny.gov/statistics/prevention/injury_prevention/information_for_action/docs/2019-05_ifa_report.pdf. Accessed August 15, 2023.
22. Centers for Disease Control and Prevention. 2016 BRFSS survey data and documentation. https://www.cdc.gov/brfss/annual_data/annual_2016.html. Accessed August 15, 2023.
23. Centers for Disease Control and Prevention. 2018 BRFSS survey data and documentation. https://www.cdc.gov/brfss/annual_data/annual_2018.html. Accessed August 8, 2023.
24. Siegel RL, Fedewa SA, Anderson WF, et al. Colorectal cancer incidence patterns in the United States, 1974–2013. *J Natl Cancer Inst*. 2017;109(8):djw322. https://doi.org/10.1093/jnci/djw322.
25. American Cancer Society. Colorectal cancer facts & figures 2020-2022. https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/colorectal-cancer-facts-and-figures/colorectal-cancer-facts-and-figures-2020-2022.pdf. Accessed August 8, 2023.
26. Lin JS, Piper MA, Perdue LA, et al. Screening for colorectal cancer: updated evidence report and systematic review for the US Preventive Services Task Force [published correction appears in *JAMA*. 2021;326(3):279]. *JAMA*. 2021;325(19):1978–1998. https://doi.org/10.1001/jama.2021.4417.
27. U.S. Preventive Services Task Force. Colorectal cancer: screening. https://www.uspreventiveservicestaskforce.org/uspstf/recommendation/colorectal-cancer-screening. Accessed August 8, 2023.
28. Ma Y, Yang Y, Wang F, et al. Obesity and risk of colorectal cancer: a systematic review of prospective studies. *PLoS One*. 2013;8(1):e53916. https://doi.org/10.1371/journal.pone.0053916.
29. Wolfe JD, Baker EH, Scarinci IC. Wealth and obesity among US adults entering midlife. *Obesity (Silver Spring)*. 2019;27(12):2067–2075. https://doi.org/10.1002/oby.22625.
30. Thomas D, Frankenberg E. Health, nutrition and prosperity: a microeconomic perspective. *Bull World Health Organ*. 2002;80(2):106–113. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2567722/.
31. Food Research & Action Center. Hunger & Health. https://frac.org/wp-content/uploads/hunger-health-impact-poverty-food-insecurity-health-well-being.pdf. Accessed August 15, 2023.
32. Food Research & Action Center. Working to end hunger in America. www.frac.org. Accessed August 15, 2023.
33. Drewnowski A. Obesity, diets, and social inequalities. *Nutr Rev*. 2009;67(Suppl 1):S36–S39. https://doi.org/10.1111/j.1753-4887.2009.00157.x.