The role of financial fragility & travel distance in colorectal cancer patients from rural populations

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Introduction

- Colorectal cancer (CRC) is the second most common cause of cancer-related death in the US.
- Rural patients are at a 4% higher risk of death from cancer vs urban patients.
- In the US, median travel time to academic based care is 30 minutes (IQR, 13–72 minutes.)
- Rural patients travel on average 19 miles more to seek care vs urban patients.
- Financial fragility is a measure of an accumulation of resource deficits (financial means & educational attainment) and inconveniencing factors (travel burden, facility type, residential location) that impedes prompt initiation & continuation of care, which in turn leads to adverse health outcomes.

Purpose

- Evaluate the influence of travel distance and accumulation of deficits that serve as a barrier to initiating CRC care in stages I – III by using FF as a predictive model.
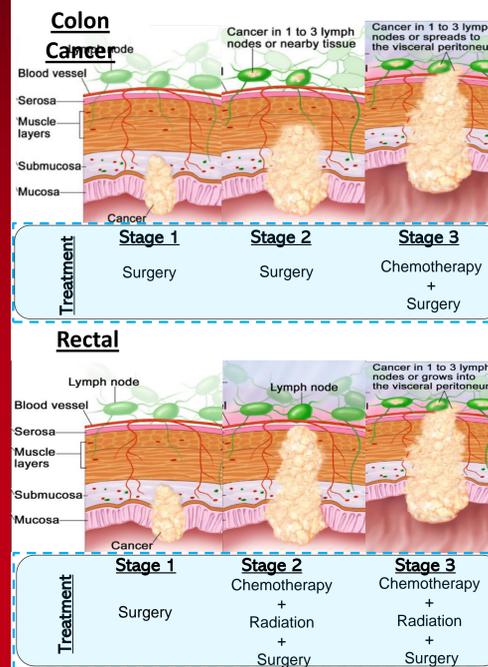- Assess and compare cancer care between rural and urban populations.

Methods

- A literature was performed using PubMed, Library of Congress, LISTA (EBSCO) and Web of Science. Keywords included: "Travel distance", "Colorectal Cancer" and "Access to care" in all fields.
- National Cancer Data Base (NCDB) 4 variables encompass FF; distance traveled, educational attainment, median income, population type.
- Analysis of UofL Brown Cancer and NCDB center via SPSS.
- NCDB was used to identify 90,000 patients with stage 1-2 colon cancer and 67,000 with stage 1-2 rectal to cancer to compare completion of recommended therapies between rural/urban/metro populations.
- For UofL data case control matching was performed to produce urban and rural cohorts to assess the proportion of patients receiving stage-appropriate therapies.

Results
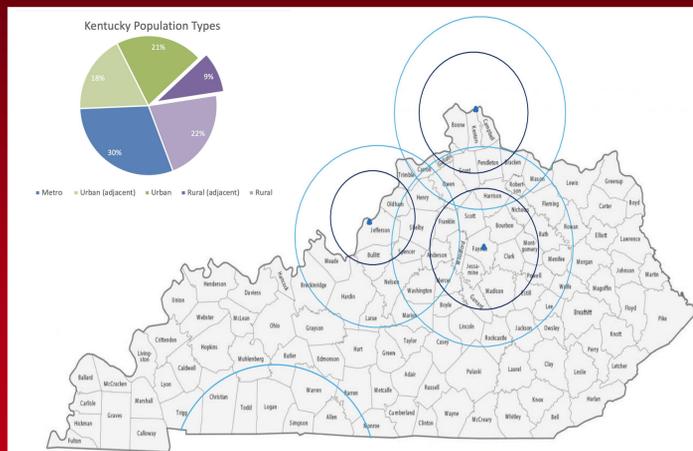
Figure 1. Kentucky patients limited access to academic care.
The University of Kentucky (Fayette) & the University of Louisville (Jefferson) are the only in state options for patients to receive academic care. As border states OH & TN offer care from the University of Cincinnati & Vanderbilt University. On average in the US, traveling to an academic center takes 30 mins (IQR 13 mins – 72 min.) Travel time (driving) to respective centers is represented by the circles. Dark blue represents 30 minutes and light blue represents 72 minutes.

Table 2. Univariate Analysis	Univariate (OR)	p value	Multivariate (OR)	p value
Median Distance traveled				
	0.991 (0.989 – 0.993)	Less than 0.01		Less than 0.01
Facility Type				
Community Center *(Ref.)*				
Comprehensive Community	1.097 (0.963 – 1.041)	Less than 0.01	1.196 (1.155 – 1.238)	Less than 0.01
Academic Center	0.959 (0.966 – 1.046)	0.007	1.008 (0.972 – 1.046)	Less than 0.01
Integrated Cancer Network	1.133 (0.891 – 0.980)	Less than 0.01	1.228 (1.181 – 1.276)	Less than 0.01
Race				
White *(Ref.)*				
Black	0.879 (0.857 – 0.903)	Less than 0.01	0.775 (0.750 – 0.801)	Less than 0.01
Other	0.786 (0.759 – 0.815)	Less than 0.01	0.743 (0.711 – 0.776)	Less than 0.01
Insurance Status				
Uninsured *(Ref.)*				
Private	1.479 (1.410 – 1.552)	Less than 0.01	1.413 (1.335 – 1.497)	Less than 0.01
Medicare	0.840 (0.802 – 0.881)	Less than 0.01	1.337 (1.262 – 1.416)	Less than 0.01
Income				
<38,000 *(Ref.)*				
38,000 - 47,900	1.080 (1.052 – 1.109)	Less than 0.01	1.073 (1.041 – 1.107)	Less than 0.01
48,000 – 63,900	1.086 (1.058 – 1.114)	Less than 0.01	1.061 (1.063 – 1.130)	Less than 0.01
>63,000	1.079 (1.052 – 1.106)	Less than 0.01	1.061 (1.028 – 1.094)	Less than 0.01
Education				
>17.6 *(Ref.)*				
10.9-17.5%	1.164 (1.135 – 1.194)	Less than 0.01	1.197 (0.128 – 0.134)	Less than 0.01
6.3-10.8%	1.228 (1.198 – 1.258)	Less than 0.01	1.293 (0.128 – 0.134)	Less than 0.01
<6.3%	1.275 (1.198 – 1.258)	Less than 0.01	1.344 (0.128 – 0.134)	Less than 0.01
Population type				
Metro *(Ref.)*				
Urban	1.062 (1.037 – 1.088)	Less than 0.01	1.218 (1.183 – 1.255)	Less than 0.01
Rural	1.138 (1.068 – 1.213)	Less than 0.01	1.420 (1.317 – 1.531)	Less than 0.01
Cancer Type				
Rectum (vs Colon)	0.484 (0.476 – 0.492)	Less than 0.01	0.666 (0.613 – 0.587)	Less than 0.01
Multimodal Therapy				
Need multimodal therapy	0.156 (0.153 – 0.159)	Less than 0.01	0.131 (0.128 – 0.134)	Less than 0.01

Colon Cancer

Rectal

Table 1. NCDB Demographics	Sub – optimal completion of recommended therapies	Completion of all recommended therapies	p value
Cancer type			Less than 0.01
Colon	46.6%	64.8%	
Rectum	53.4%	35.2%	
Multimodal therapy needed			Less than 0.01
Multimodal therapy	78.8%	36.9%	
Age			Less than 0.01
Age - mean or median (SD or 95%CI)	70.6	65.5	
Sex			0.34
Male - n	53.6%	53.4%	
Race			2.76 x10 -45
Race – White – n(%)	82.7%	84.9%	
Race - Black	11.2%	10.2%	
Race - Other	6.1%	4.8%	
Insurance Status			Less than 0.01
Private	27.1%	39.3%	
Medicare	67.2%	55.8%	
Uninsured	3.27%	3.21%	
Income			1.14x-10
<38,000	18.6%	17.5%	
38,000 - 47,900	23.7%	24.1%	
48,000 – 63,900	26.2%	26.7%	

Figure 2. Understanding Colon and Rectal Cancer.
Cancer staging uses the TNM system. If/how far the tumor has grown, if cancer is present in lymph nodes and if the cancer has spread (metastasis.) Both Colon and Rectal cancers have 5 stages (0-4.)
Colon Cancer:
Stage 1: cancer has grown into the second or third layer of the colon wall. *Stage 2:* cancer has grown into or pass the fourth layer of the colon wall. *Stage 3:* cancer has spread from the colon to nearby lymph node.
Rectal cancer:
Stage 1 cancer has invaded the submucosa or muscilaris propia of the rectal wall. *Stage 2* cancer has grown past rectal wall and possible invasion of nearby structures/ tissues. *Stage 3* cancer has spread to nearby lymph node but not areas far from the rectum.

NCCN Guidelines® for Colon Cancer, Rectal Cancer, Version 2.2021 – January 21, 2021.

- Completion of recommended therapies favored rectal cancer patients who traveled from an urban area to another urban area to receive care: 71% local urban population vs 88 % traveled- urban vs 79% traveled- rural.

Table 3. Local Data 478 total patients	Rural	Urban	p value
Guideline adherent care	82.30%	71.10%	less than 0.02
Need for MMT	63%	82%	less than 0.02
Received MMT	78%	66%	less than 0.02

Table 1.
- Colon cancer patients are 64% more likely to complete all recommended therapies.
- If multimodal therapy is needed patients are less likely to complete all recommended therapies.
- Minority patients are at a disadvantage in comparison to white patients in both sub-optimal and completion of all recommended therapies.
- The median distance traveled of those completed therapy and sub-optimal completion are comparable 8.1 vs 8.7.

Table 2.
- There are increased odds of completing all recommended therapies for those that
- Are diagnosed with rectal cancer
- Receiving care at comprehensive community center
- Identify as white
- Have private insurance
- have an income between $38000 – $47900
- Are from a rural area

Table 3:
- Rural Kentucky patients receive enhanced guideline adherent care. (82.3%)
- Rural patients more frequently needed MMT due to higher staging. (78%)

Future directions

- Investigate barriers that impede urban patients from receiving guideline adherent care.
- Understand varying factors that are present when receiving care in an urban area. Investigate if factors have differing influence on urban and rural populations.

Acknowledgements

Conclusions

- Nationally, as supported by NCDB data, the healthcare barrier for inner-city patients outweighs the barrier of distance for rural patients, as the odds for completion of recommended therapy for rural patients was increased.
- On a local level, rural patients demonstrated lower median survival in comparison to urban counterparts. However, when guideline adherent care is optimal median survival is partially corrected.
- Moreover, when comparing guideline-adherent care amongst rural and urban populations in Kentucky, our study indicates that urban-living Kentuckians with colorectal cancer receive sub-optimal care.