Association between County-Level Characteristics and Cancer Clinical Trial Rates in the US, 2010-2021

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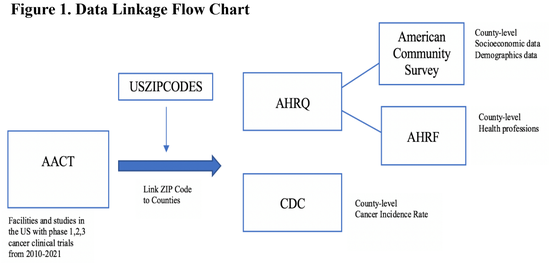
Introduction

- Cancer clinical trials are essential for the development of new treatments and the improvement of survival outcomes in cancer patients. Less is known about the about the development trends and how area-level characteristics are associated with new trial development.
- This cross-sectional study used county-level information from ClinicalTrials.gov (AACT) database and several public data sources for county-level characteristics in the US. The main outcomes was the number and rate of new cancer clinical trials from 2010 to 2021. The overall pattern of cancer clinical trials over 12 years and the geographical distribution of trail sites across the US was analyzed.

Methods

- Sample: phase I-III cancer clinical trials registered between 2010 and 2021 with county-level sociodemographic information from AHRQ and SDOH, healthcare provider information from AHRF, and cancer incidence data from State Cancer Profile.
- Primary analysis: logistic regression for examining whether county-level sociodemographic characteristics, healthcare providers, and cancer incidence rate were associated with having at least one cancer clinical trial
- Secondary analysis: multivariate linear regression for examining rate of cancer clinical trials per 100,000 population median age, median household income, proportion of population with bachelor's degree or higher, proportion of minorities population, number of medical specialists per 100,000 population, and cancer incidence rate per 100,000 population.

Figure 1. Data Linkage Flow Chart



Results

Figure 2. Geographic distribution of county-level cancer clinical trial sites in the US from 2010 to 2021

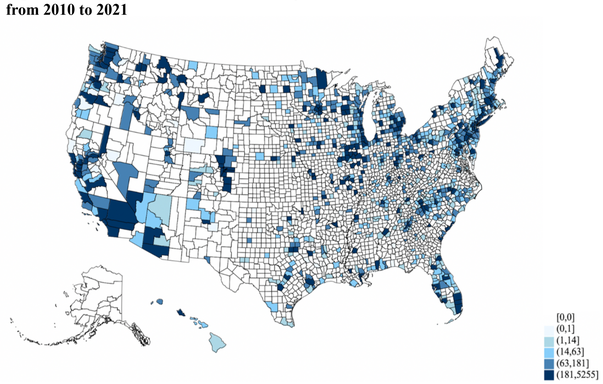


Figure 3. Yearly Trend for Cancer Studies from 2010 to 2021

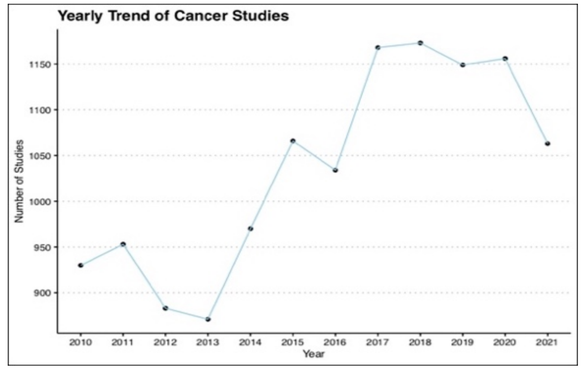


Table 1. Results from Logistic Regression

County-Level Characteristics	Odds Ratio (95%CI)	P-value
Population		
Quintile 1: 41 – 9,313	Ref	
Quintile 2: 9,313 – 19,226	4.99 (2.00 to 14.80)	0.001
Quintile 3: 19,226 – 36,644	12.49 (5.28 to 35.85)	<0.001
Quintile 4: 36,644 – 87,676	36.07 (1.53 to 103.2)	<0.001
Quintile 5: 87,676 – 9,758,256	355.96 (140.00 to 1074.71)	<0.001
Median Age		
Quintile 1: 21.6 – 36.6	Ref	
Quintile 2: 36.6 – 39.6	1.13 (0.74 to 1.74)	0.58
Quintile 3: 39.6 – 41.8	1.07 (0.69 to 1.68)	0.75
Quintile 4: 41.8 – 44.5	1.54 (0.96 to 2.48)	0.07
Quintile 5: 44.5 – 64.5	1.82 (1.09 to 3.05)	0.02
Median Household Income		
Quintile 1: $10,932 - $35,247	Ref	
Quintile 2: $35,247 - $40,092	1.53 (0.93 to 2.55)	0.10
Quintile 3: $40,092 - $44,381	1.44 (8.52 to 2.46)	0.18
Quintile 4: $44,381 - $50,944	1.83 (1.07 to 3.17)	0.03
Quintile 5: $50,944 - $115,574	1.15 (0.64 to 2.09)	0.65
Educational Attainment with Bachelor's Degree or Higher (%)		
Quintile 1: 2.99% - 11,59%	Ref	
Quintile 2: 11.59% –14.55%	1.36 (0.85 to 2.21)	0.20
Quintile 3: 14.55% - 17.54%	1.14 (0.68 to 1.91)	0.62
Quintile 4: 17.54% - 22.96%	2.08 (1.23 to 3.54)	0.007
Quintile 5: 22.96% - 62.28%	1.67 (0.90 to 3.11)	0.11
Minorities (%)		
Quintile 1: 0 – 3.406%	Ref	
Quintile 2: 3.41 – 6.75%	1.12 (0.73 to 1.71)	0.61
Quintile 3: 6.75% – 13.42%	1.07 (0.70 to 1.65)	0.76
Quintile 4: 13.42% – 27.18%	0.50 (0.37 to 0.96)	0.03
Quintile 5: 27.18% – 96.68%	0.51 (0.30 to 0.86)	0.01
Medical Specialists (n)	1.03 (1.03 to 1.04)	<0.001
Cancer Incidence Rate (n)		
Quintile 1: 157.40 – 407.70	Ref	
Quintile 2: 407.70 – 445.06	1.45 (0.92 to 2.30)	0.12
Quintile 3: 445.06 – 470.10	1.40 (0.88 to 2.22)	0.16
Quintile 4: 470.10 – 496.20	1.81 (1.15 to 2.88)	0.01
Quintile 5: 489.45 – 1136.40	1.62 (1.01 to 2.61)	0.04

*Notes: Significant at α =5%

Table 2. Results from Multivariate Linear Regression

County-Level Characteristics	Estimate (95%CI)	P-value
Median Age		
Quintile 1: 21.6 – 36.6	Ref	
Quintile 2: 36.6 – 39.6	1.10 (0.82 to 1.48)	0.52
Quintile 3: 39.6 – 41.8	1.15 (0.83 to 1.61)	0.39
Quintile 4: 41.8 – 44.5	0.73 (0.50 to 1.06)	0.10
Quintile 5: 44.5 – 64.5	0.76 (0.51 to 1.14)	0.19
Median Household Income		
Quintile 1: $10,932 - $35,247	Ref	
Quintile 2: $35,247 - $40,092	1.72 (0.97 to 3.06)	0.06
Quintile 3: $40,092 - $44,381	2.16 (1.22 to 3.81)	0.01
Quintile 4: $44,381 - $50,944	1.64 (0.93 to 2.89)	0.08
Quintile 5: $50,944 - $115,574	0.99 (0.55 to 1.76)	0.97
Educational Attainment with Bachelor's Degree or Higher (%)		
Quintile 1: 2.99% - 11,59%	Ref	
Quintile 2: 11.59% –14.55%	1.41 (0.77 to 2.59)	0.26
Quintile 3: 14.55% - 17.54%	1.06 (0.57 to 1.95)	0.86
Quintile 4: 17.54% - 22.96%	1.22 (0.67 to 2.22)	0.51
Quintile 5: 22.96% - 62.28%	1.42 (0.76 to 2.66)	0.27
Minorities (%)		
Quintile 1: 0 – 3.406%	Ref	
Quintile 2: 3.406 – 6.745%	0.64 (0.41 to 1.01)	0.06
Quintile 3: 6.745% – 13.424%	0.52 (0.34 to 0.82)	0.005
Quintile 4: 13.424% – 27.179%	0.46 (0.29 to 0.73)	0.001
Quintile 5: 27.179% – 96.675%	0.37 (0.23 to 0.61)	<0.001
Medical Specialists (n)	1.01 (1.00 to 1.01)	<0.001
Cancer Incidence Rate (n)		
Quintile 1: 157.40 – 407.70	Ref	
Quintile 2: 407.70 – 445.06	0.97 (0.65 to 1.43)	0.86
Quintile 3: 445.06 – 470.10	1.16 (0.79 to 1.70)	0.46
Quintile 4: 470.10 – 496.20	1.05 (0.71 to 1.55)	0.81
Quintile 5: 489.45 – 1136.40	1.02 (0.67 to 1.54)	0.94

*Notes: Significant at α =5%

Discussion

- Potential explanations for counties with more cancer clinical trials include accessible locations of clinical trial sites, more dense and racially diverse population, economic advantages, higher education level, and substantial infrastructure support.
- Limited infrastructure in minority areas reduces clinical trial enrollment and there is also limited healthcare access. Lack of access to clinical trials for terminally ill cancer patients could have tremendous impacts on their disease development

Conclusion

In this study, we found an overall increasing trend in number of cancer clinical trials from 2010 to 2021. Counties with lower minorities and higher income level tended to have more cancer clinical trials. In general, socioeconomic, geographical factors, and healthcare resources are access barriers to cancer clinical trials.

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