Identifying High-Opportunity Areas to Strengthen Clinical Trial Access in an NCI Cancer Center Catchment Area

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Background

Ensuring that clinical trial enrollment reflects both patient populations and research capacity is a core mission of NCI-designated cancer centers. Yet geographic, structural, and disease-related barriers can limit participation across catchment areas. Despite these barriers, few have deployed systematic methods to identify which communities have both substantial patient populations and underutilized trial access.

Aims

1. Develop a **Clinical Trial Opportunity Index** using aggregated patient-level data to identify ZIP codes where trial access could be strengthened within the Robert H. Lurie Comprehensive Cancer Center's catchment area
2. Evaluate **geographic patterns and predictors** of high-opportunity locations identified to inform institutional planning for expanding trial access.

Methods

Northwestern Medicine (NM) tumor registry data (2018–2024) were linked with clinical trial enrollment records and aggregated to ZIP code at diagnosis. We characterized case volume, demographics, cancer sites, enrollment metrics, regional distribution, and drive times. The Clinical Trial Opportunity Index combined two scaled, log-transformed components: (1) the gap between case volume and enrollment volume, and (2) inverse enrollment rate. Spatial autocorrelation was assessed using Moran's I, and predictors were evaluated using a multivariable spatial lag model.

Results

Table 1. Characteristics by Clinical Trial Opportunity Index Quartile

Characteristic	Q1	Q2	Q3	Q4	Q5	P
Mean age (years)	60 (3)	60 (3)	60 (4)	62 (3)	64 (3)	<0.001
Male (%)	46 (7)	45 (5)	44 (4)	45 (5)	43 (3)	0.037
Black (%)	15 (22)	17 (25)	14 (21)	9 (20)	3 (5)	<0.001
Hispanic (%)	5 (7)	5 (6)	9 (11)	6 (9)	4 (6)	<0.001
Not central region (%)	26 (19)	22 (20)	26 (24)	51 (29)	81 (18)	<0.001
Enrolled ≤30 days (%)	4 (5)	9 (7)	14 (14)	12 (18)	14 (18)	<0.001
Days to enrollment	397 (383)	276 (136)	374 (360)	309 (169)	421 (288)	<0.001
Breast cancer (%)	20 (6)	21 (5)	20 (4)	20 (4)	22 (4)	0.019
Lung cancer (%)	6 (3)	7 (2)	7 (2)	8 (3)	10 (3)	<0.001
Prostate cancer (%)	12 (7)	12 (4)	11 (3)	12 (3)	10 (2)	0.001
Colorectal cancer (%)	7 (4)	7 (2)	7 (2)	8 (2)	9 (2)	<0.001
Uterine cancer (%)	3 (2)	3 (2)	3 (1)	4 (1)	4 (1)	<0.001

[1] Mean (SD); Kruskal-Wallis rank sum test

High-opportunity ZIP codes differed from low-opportunity areas: they had older populations (64 vs 60 years, p < 0.001), lower proportions of Black residents (3% vs 15%, p < 0.001), were predominantly outside the central region (81% vs 26%, p < 0.001), had higher timely enrollment rates (14% vs 4%, p < 0.001), and higher proportions of lung cancer cases (10% vs 6%, p < 0.001).

Spatial dependence in opportunity scores was detected (ρ = 0.37, p < 0.001), indicating that opportunity levels in neighboring areas strongly influence each other.

Table 2. Multivariable Spatial Lag Model

Variable	Total Effect	P
ρ (Spatial lag)	0.365	<0.001
Age (years)	0.009	0.002
Male (%)	-0.586	0.002
Hispanic (%)	0.310	0.004
Not central region (%)	0.309	<0.001
Enrolled ≤30 days (%)	0.005	<0.001
Lung cancer (%)	1.270	<0.001
Prostate cancer (%)	0.470	0.06
Colorectal cancer (%)	-0.354	0.29
Uterine cancer (%)	-0.955	0.10
Mean drive time (min)	-0.001	0.01

[1] Spatial lag model: N=325; Pseudo R-squared = 0.72; AIC=-653.24; LM residual autocorrelation test p=0.83

ZIP codes with lower proportions of cases from the NM central subregion had substantially higher opportunity scores (total effect = 0.31, p < 0.001). Higher opportunity was also observed in areas with greater proportions of lung cancer cases (total effect = 1.27, p < 0.001). Male sex was negatively associated with opportunity (total effect = -0.59, p = 0.002), while higher proportions of Hispanic residents showed positive associations (total effect = 0.31, p = 0.004).

Older age was weakly associated with higher opportunity (total effect = 0.009, p = 0.002). Higher timely enrollment (≤30 days) was associated with higher opportunity scores (total effect = 0.005, p < 0.001), while longer mean drive time showed a small negative association (total effect = -0.001 per minute, p = 0.01).

The spatial lag model explained 72% of overall variation in opportunity scores (pseudo R² = 0.72; AIC = -653; n = 325 ZIP codes), with no residual spatial autocorrelation detected (LM test p = 0.83).

Figure 1. Clinical Trial Opportunity Index Across LCC-CA
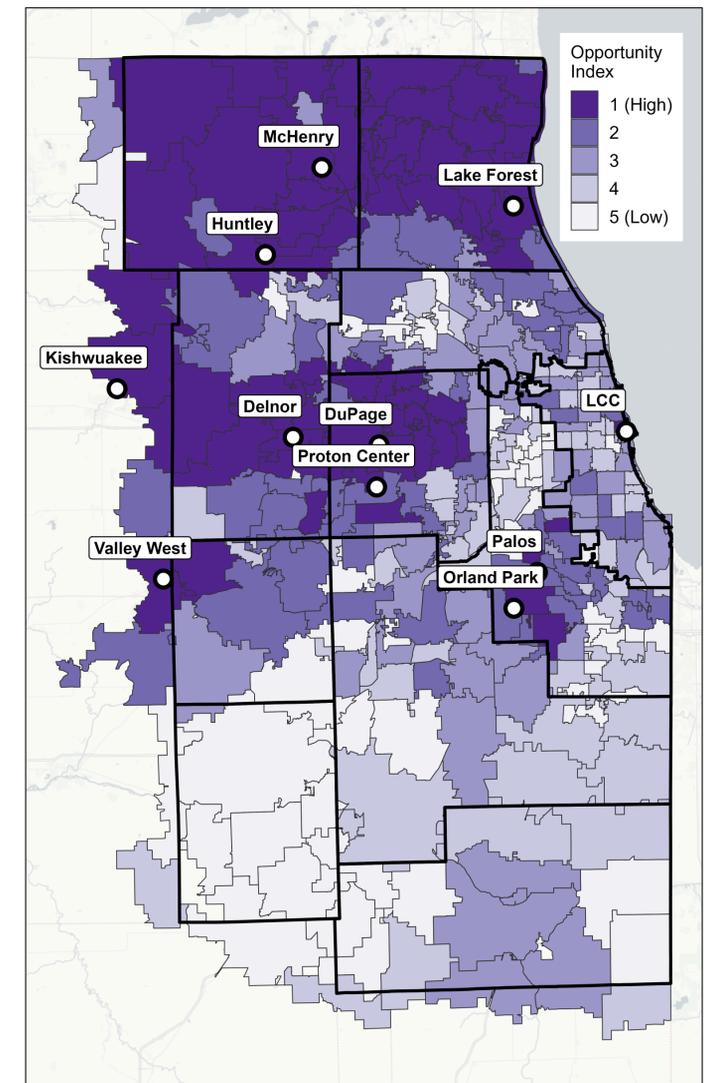
Conclusion

Leveraging linked registry and clinical trial data, we identified geographic clusters of ZIP codes that represent high-opportunity areas for strengthening clinical trial engagement across the catchment area. These areas were predominantly in non-central regions and experienced a higher lung cancer burden. Substantial spatial clustering (ρ = 0.37) indicates that interventions in high-opportunity areas may have spillover effects to neighboring communities. This framework provides a pragmatic, data-driven approach to guide outreach, trial placement, and resource allocation to strengthen clinical trial access across catchment areas.