

Research Article

Geographical Variation in Ophthalmological Care Correlates to Economic Well-being in Florida

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Abstract

Purpose: This study aims to quantify the relationship between economic disadvantage and access to eye care in the state of Florida by synthesizing multiple metrics of care. The access metrics presented can help policymakers target interventions to areas most in need and monitor progress towards improving access.

Material and Methods: Data from the Center for Medicaid and Medicare Services were analyzed with the Distressed Community Index (DCI), a metric developed by Economic Innovation Group which stratifies zip codes into 5 levels of economic well-being. An association between DCI and eye providers per capita was assessed using a Kruskal-Wallis test. Included are the 920 Florida zip codes included in the Economic Innovation Group's Distressed Community Index (DCI). The Economic Innovation Group states all zip codes in the United States with populations greater than 500 are included in the DCI data set.

Results: In Florida, 42.6% of zip codes have neither an ophthalmologist nor an optometrist.

Number of providers per capita significantly differs by DCI category ($p < .001$) with areas of lowest deprivation having an average of 0.23 ± 0.37 providers per thousand residents and areas of highest deprivation having 0.09 ± 0.19 providers per thousand. DCI quintiles of highest deprivation were significantly more likely to not have an eye provider ($p < .001$) with 30.5% of zip codes in the lowest deprivation quintile having no providers vs. 62.2% in that of the highest deprivation quintile.

Discussion: Findings indicate that economically disadvantaged zip codes have significantly less access to eye care compared to their more affluent counterparts. Given that Florida has the highest current prevalence and projected per capita prevalence of visual impairment, investigation and efforts to maximize access to ophthalmological care is paramount.

Keywords: Distressed Community Index; Visual Impairment; Blindness; Ophthalmologist

Introduction

The world's growing and aging population presents a significant economic and social impact as the prevalence of Visual Impairment (VI) and blindness continues to rise [1]. In the United States alone, the number of individuals with VI and blindness is expected to increase significantly in the coming decades [1]. In 2015, approximately 1.02 million people in the United States were blind and 3.22 million had moderate to severe vision impairment [1]. Projections indicate that by 2050, these numbers are estimated to double, with 2.01 million people in the United States affected by blindness and 6.95 million, affected by VI [1]. The growing number of people affected by visual impairment and blindness emphasizes the importance of identifying barriers to eye care and identifying interventions to reduce the prevalence of VI and blindness.

Additionally, literature has shown that VI and blindness are associated with health conditions such as diabetes, hypertension and obesity [2]. These conditions are intricately connected to the social determinants of health, which are themselves impacted

by the economic well-being of communities [3]. This study hypothesized that, like previous studies have shown in primary care, areas of distress or unfavorable social determinants of health and poor economic well-being, have less access to eye care [4]. Accordingly, this study aims to quantify the relationship between economic disadvantage and access to eye care in the state of Florida, given that the state has the highest current and projected per capita prevalence of VI [1]. By identifying areas where eye care is lacking, the study seeks to call for further investigation on the accessibility of eye care and highlight opportunities for policymakers to prioritize interventions in communities that require them the most.

Material and Methods

Datasets

The distressed community index (DCI) is an index developed by the Economic Innovation Group using the US Census Bureau's Business Patterns and American Community Survey 5-Year Estimates for 2016-2020 [5]. It is a figure which measures a communities level of economic well-being factoring in 7 metrics: percent of the 25-year-old population without a high school diploma, percent of habitable housing that is unoccupied (excluding properties which are seasonal, recreational or occasional use) percent of 25-54 year-old population not employed, percent of the population living under the poverty line, median household income as a percent of the metro area median household income (or state for non-metro areas), percent change in number of jobs from 2016-2020 and percent change in number of business establishments from 2016-2020 [5]. Based on these 7 metrics, each zip code is ranked with an index from 1 to 5 which represent prosperous, comfortable, mid-tier, at risk or distressed, respectively [5]. The DCI dataset covers upwards of 99 percent of the US population, including over 26,000 zip codes with at least 500 residents. Of these 26,000 zip codes, 920 are Florida zip codes [5].

The DCI was merged to the Center for Medicare and Medicaid Services (CMS) physician compare provider data catalog by zip code. This is an index of all of the providers who have the following [6]

- A current and Current and "approved" Medicare enrollment records in PECOS
- Valid physical practice location or address
- A valid specialty
- A National Provider Identifier (NPI) for a clinician
- At least one Medicare Fee-for-Service claim within the last six months for a clinician
- For groups, at least two approved clinicians reassigning their benefits to the group

Data Extraction and Analysis

The eye providers (combined optometrists and ophthalmologists) practicing in Florida from the CMS physician compare provider data catalog were extracted and grouped by zip code. This data was merged to the Florida zip codes represented in the DCI data set. Any zip codes without providers listed in the CMS physician compare provider data catalog were assigned 0 providers per capita. Number of providers per capita was calculated for each zip code with at least 1 eye provider using the DCI data set's population estimate. An association between DCI and eye providers per capita was assessed using a Kruskal-Wallis test. Secondary outcome of urban/rural designation was assessed using chi-squared tests. Analysis was completed using SPSS Version 29.

Results

A total of 920 Florida zip codes were analyzed, of which 538 (57.4%) had at least one provider, while 392 (42.6%) had 0 providers. The number of providers per zip code ranged from 0 to 83 with an average of 4.45 ± 7.86 . Overall, number of providers per thousand population ranged from 0 to 3.45 with an average of 0.178 ± 0.345 . DCI ranges from 1 (least distressed) to 5 (most distressed). Zip codes included in the study were 20.7% DCI of 1, 23.2% DCI of 2, 23.2% DCI of 3, 20.1% DCI of 4 and 12.9% DCI of 5. Number of providers (per thousand) was significantly associated with DCI ($p < .001$) with areas of lower deprivation having higher numbers of providers, as seen in Table 1. Areas of higher deprivation were more likely to have zero providers ($p < .001$) than areas of lower deprivation.

DCI Quintile	Zip Codes (N)	Zip Codes with Zero Providers (%)	Number of Providers (Per Thousand) (Mean $\pm$ Standard Deviation)
1 (least deprived)	190	58 (30.5)	0.23 $\pm$ 0.37
2	213	79 (37.1)	0.23 $\pm$ 0.42
3	213	86 (40.4)	0.16 $\pm$ 0.25
4	185	95 (51.4)	0.15 $\pm$ 0.38
5 (most deprived)	119	74 (62.2)	0.08 $\pm$ 0.19

Table 1: Percentage of zip codes with zero eye providers and number of providers per capita by DCI quintile.

Zip codes were designated as 19.1% rural, 10.8% small town, 53.6% suburban and 16% urban. As seen in Table 2, Urban zip codes were least likely to have zero providers, compared to suburban, small town and rural zip codes, $p < .001$. Rural zip codes had significantly less providers per capita than other designations ($p < .001$) with 0.05 ± 0.212 per thousand. Providers per capita decreased with each urban designation; pairwise comparisons showed that rural zip codes were significantly lower but other designations did not significantly differ from each other.

Designation	Zip Codes (N)	Zip Codes with Zero Providers	Number of Providers (Per Thousand) (Mean $\pm$ Standard Deviation)
Urban	176	29.6%	0.24 $\pm$ 0.43
Suburban	493	31.4%	0.21 $\pm$ 0.36
Small Town	99	40.4%	0.16 $\pm$ 0.25
Rural	152	86.4%	0.05 $\pm$ 0.21

Table 2: Percentage of zip codes with zero eye providers and number of providers per capita by urban rural designation.

Discussion

In the present work, we provide evidence that Florida zip codes with higher economic distress are less likely to have an eye care provider. This outcome aligns with similar findings reported by Ervin, et al., and Javitt, et al., [7,8]. More specifically, our analysis revealed that the number of zip codes without eye care providers was approximately twice as high in the highest deprivation quintile as compared to the lowest deprivation quintile. These findings underscore the existing disparities in access to essential eye care services, particularly between economically distressed communities and affluent communities. Prior research has already described the disparities in health care for ophthalmological conditions and associated chronic conditions, in the context of economic factors. For example, zip codes with higher poverty rates have been shown to have a higher prevalence of diabetes and diabetic retinopathy, as well as lower rates of diabetic retinopathy diagnosis [9]. Additionally, individuals from communities in the lowest income decile are at a higher hazard of graft failure after penetrating keratoplasty [10]. Furthermore, the disparity dilemma presents itself even in the quality of clinical tests in the ophthalmic setting. One study found that Black patients, especially those in lower income brackets, had greater variability in their longitudinal visual field testing, as compared to white patients. This negatively impacted the ability of clinicians to detect these patients' glaucoma progression in a timely fashion [11]. Individuals from deprived zip codes are also less likely to attend diabetic retinopathy screening events in the community [12]. We add to these findings via our work's emphasis on the lower likelihood of available eye care providers in zip codes of the highest economic distress.

Economic distress is not the only factor that affects ophthalmic care. It has been well established that race, ethnicity and age are critical social determinants of the prevalence of ophthalmic disease and the access and utilization of ophthalmic care. For example, one study indicated that Black patients were less likely to receive cataract surgery than their white, Asian and Latino counterparts [13]. In addition, Hispanic ethnicity, Black race and low income increased the likelihood of no-show visits for patients with glaucoma, diabetic retinopathy or age-related macular degeneration [14]. Moreover, elderly patients (≥ 90 years old) and patients who had to travel for over 2 hours to the clinic demonstrated a greater rate of missing follow-up visits after cataract surgery [15]. Age is an especially concerning factor because elderly patients often face financial insecurity, transportation issues and technological barriers. This is particularly important to keep in mind when addressing care in Florida, since the proportion of elderly individuals in Florida is almost the largest nation-wide. These findings, in addition to our study's evidence that there are fewer or even zero eye care providers in distressed Florida zip codes, raise quite a bit of concern.

There are, of course, limitations to this study. While we analyzed the per capita availability of eye care providers, which may be a representative metric of access to care, we did not directly analyze the differences in utilization of care across zip codes of different distress levels. We also did not examine factors such as insurance coverage, access to transportation and distance to the closest eye care provider. Important areas of future study include studying the specific barriers by distressed community index associated with not having an eye provider in one's zip code. For example, exploration of whether patients in more distressed communities have access to transportation to and from appointments. Additionally, the difference in the scope of practice between ophthalmologists and optometrists makes studying the effects of the geographical variation of each by zip code and DCI another important area of further analysis. Another area of study includes investigating the outcomes of fewer providers per capita. That being said, it is important to note that we communicate a strong finding, based on a set of almost 1000 zip codes, that emphasizes how there is not a single ophthalmologist or optometrist in roughly two thirds of the most economically distressed zip codes.

Conclusion

Ultimately, the results reported here, in addition to prior findings, paint a complex picture of the socio-economic issues in ophthalmic care. Overall, this study shows that areas of more economic deprivation have less eye providers in Florida. Given Florida's growing and aging population it is crucial to ensure that eye care is accessible. This study calls for efforts to investigate the effects of this geographical variation by economic deprivation in order to address the growing need for eye providers as the population of Florida continues to evolve. We hope that by bringing attention to the potential insufficiency of ophthalmic care in Florida, particularly in economically distressed areas, policymakers and researchers can focus their efforts on the communities that need help the most.

Conflict of Interests

The authors have no conflict of interest to declare.

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