

# Bridging the Gap in Diabetic Retinopathy Screening: Public Health Data Insights for Internal Medicine and Osteopathic Practice

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## Abstract

Diabetic retinopathy (DR) remains a leading cause of preventable blindness, particularly in underserved populations. Timely diagnosis and treatment depend on early diabetes detection and consistent access to routine care; both of which may be influenced by social determinants such as insurance coverage and provider availability. However, regional data on DR screening adherence remains limited, making it difficult to quantify disparities in preventive eye care. The purpose of this review is to examine how county-level measures of insurance coverage, diabetes prevalence, preventive checkup rates, and provider shortage severity (Health Professional Shortage Area [HPSA] scores) interact as structural determinants of disparities relevant to DR screening. We performed a secondary analysis of a publicly available CDC dataset encompassing all 6,288 U.S. counties. Three variables were selected: Insurance, Diabetes, and Checkup. Insurance coverage was used as a proxy for healthcare access. To assess the role of provider availability, HPSA scores were merged with the dataset for the subset of counties with available data (N = 2,260). Descriptive statistics were calculated, and Pearson correlation coefficients were used to evaluate associations among variables. All correlations were statistically significant ( $p < 0.00001$ ) due to large sample sizes, and the coefficients were moderate in magnitude. Mean county-level insurance coverage was 89.7%, diabetes prevalence 12.3%, and checkup rate 75.2%. Insurance coverage was negatively correlated with diabetes prevalence and positively correlated with checkup rates. Diabetes prevalence was positively correlated with checkup rates, potentially reflecting increased healthcare utilization after diagnosis. Among counties with HPSA data, higher shortage scores were associated with lower insurance, higher diabetes prevalence, and lower checkup rates. Although this dataset does not include direct measures of diabetic retinopathy screening, it highlights structural access barriers that likely contribute to downstream DR care gaps and stress the importance of integrating preventive eye care efforts into internal medicine practice.

## Introduction

Diabetic retinopathy (DR) is the most common microvascular complication of diabetes and leading cause of preventable blindness.

**Global burden:** 537M adults with diabetes (2021) → projected 784M by 2045<sup>1</sup>.

### U.S. prevalence (2021):

- 9.6M adults with DR<sup>2</sup>.
- 1.84M with vision-threatening DR<sup>2</sup>.
- Higher rates in males, Hispanic, and Black adults.
- **Screening gap:** Only 55–60% of adults with diabetes receive annual eye exams<sup>3</sup>.

• **Barriers of DR screening:** Lack of insurance, provider shortages, rural/low-income access issues<sup>4</sup>.

• **Research Objectives are to:** Assess links between insurance, diabetes, checkups, and provider shortages to identify structural determinants of DR screening gaps.

## Methodology

### Data Sources:

#### CDC PLACES Project (2021):

- % adults with health insurance
- % adults diagnosed with diabetes
- % adults reporting a physical exam in past 5 years

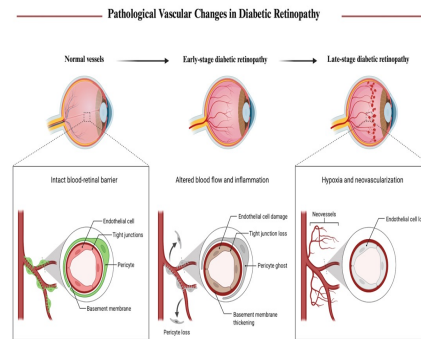
**HRSA HPSA Database:** County-level Health Professional Shortage Area (HPSA) scores (range 0–25; higher = greater shortage).

#### Study Population:

- 6,288 U.S. counties with CDC PLACES data
- Subset: 2,260 counties with available HPSA data

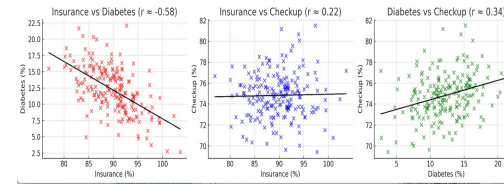
#### Analysis:

- Descriptive statistics for all variables
- Pearson correlations among Insurance, Diabetes, Checkup, and HPSA scores
- Independent t-tests to compare counties with vs. without HPSA designation
- **Significance threshold:**  $p < 0.00001$

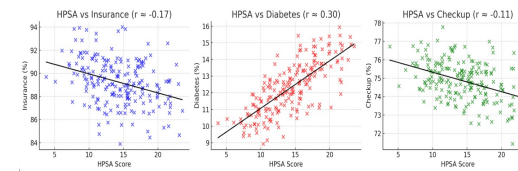


**Figure 1: Pathological vascular changes in diabetic retinopathy.** Chronic hyperglycemia leads to endothelial injury, pericyte loss, and basement membrane thickening, disrupting the blood–retinal barrier. Early DR is characterized by altered blood flow and inflammation, while late-stage DR involves hypoxia-driven neovascularization, ultimately increasing the risk of vision-threatening complications. [Created in https://BioRender.com](https://BioRender.com)

## Results

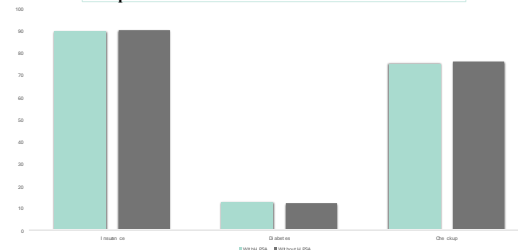


**Figure 2: Correlations among county-level primary variables:** Insurance coverage demonstrated a significant inverse correlation with diabetes prevalence ( $r = -0.58, p < 0.00001$ ) and a positive correlation with preventive checkup rates ( $r = 0.22, p < 0.00001$ ). Diabetes prevalence was positively correlated with preventive checkup rates ( $r = 0.34, p < 0.00001$ ). [Created in https://BioRender.com](https://BioRender.com)



**Figure 3: Correlations between Health Professional Shortage Area (HPSA) scores and primary variables.** Higher HPSA scores, reflecting greater provider shortages, were significantly associated with lower insurance coverage ( $r = -0.166, p < 0.00001$ ), higher diabetes prevalence ( $r = 0.302, p < 0.00001$ ), and lower preventive checkup rates ( $r = -0.113, p < 0.00001$ ). [Created in https://BioRender.com](https://BioRender.com)

### Comparison of Counties With vs Without HPSA Data



**Figure 4: Comparison of counties with vs. without HPSA data.** Counties with HPSA scores available had slightly lower insurance coverage (89.55% vs. 90.02%), higher diabetes prevalence (12.41% vs. 12.09%), and lower preventive checkup rates (74.93% vs. 75.85%) compared with counties without HPSA scores. While the absolute differences were small, they were statistically significant due to the large sample size, suggesting modest but consistent structural disparities. [Created in https://BioRender.com](https://BioRender.com)

## Conclusion

### Key Findings:

- Counties with **low insurance coverage, high diabetes prevalence, and low preventive checkups** face the greatest structural barriers to DR screening.
- **Provider shortages** (HPSA scores) further amplify disparities in access and outcomes.
- Findings highlight **upstream determinants** of vision-threatening disease.

### Clinical & Policy Implications:

- **Internal medicine physicians** are uniquely positioned:
  - 1) To incorporate **retinal screening (AI/teleophthalmology)** into routine diabetes visits.
  - 2) Reinforce adherence to **annual eye exams** during preventive care.
  - 3) Coordinate with ophthalmologists, diabetes educators, and community health workers to close referral gaps.

### Limitations:

- Self-reported CDC PLACES data may introduce bias.
- Proxy measures (insurance, checkups, HPSA) used instead of direct DR screening.
- Incomplete HPSA coverage → limits generalizability.

## References and Acknowledgments:

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