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# Large Disparities in Receipt of Glaucoma Care between Enrollees in Medicaid and Those with Commercial Health Insurance

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***Purpose:*** To determine whether the type of health insurance a patient possesses and a patient's race/ethnicity affect receipt of common tests to monitor open-angle glaucoma (OAG).

***Design:*** Retrospective longitudinal cohort study.

***Participants:*** A total of 21 766 persons aged ≥40 years with newly diagnosed OAG between 2007 and 2011 enrolled in Medicaid or a large United States managed care network.

***Methods:*** We determined the proportion of patients with newly diagnosed OAG who underwent visual field (VF) testing, fundus photography (FP), other ocular imaging (OOI), or none of these tests within the first 15 months after initial OAG diagnosis. Multivariable logistic regression was used to assess the extent by which health insurance type and race/ethnicity affected the odds of undergoing glaucoma testing.

***Main Outcome Measures:*** Odds ratios (OR) of undergoing VF testing, FP, OOI, or none of these tests in the 15 months after initial OAG diagnosis with 95% confidence intervals (CI).

***Results:*** A total of 18 372 persons with commercial health insurance and 3394 Medicaid recipients met the study inclusion criteria. The proportions of persons with commercial health insurance with newly diagnosed OAG who underwent VF, FP, and OOI were 63%, 22%, and 54%, respectively, whereas the proportions were 35%, 19%, and 30%, respectively, for Medicaid recipients. Compared with those with commercial health insurance, Medicaid recipients were 234% more likely to not receive any glaucoma testing in the 15 months after initial diagnosis (OR = 3.34; 95% CI, 3.07–3.63). After adjustment for confounders, whites with OAG enrolled in Medicaid had 198% higher odds of receiving no glaucoma testing compared with whites possessing commercial health insurance (OR = 2.98; 95% CI, 2.66–3.33). Blacks with Medicaid insurance demonstrated 291% higher odds (OR = 3.91; 95% CI, 3.40–4.49) of not receiving any glaucoma testing compared with blacks with commercial health insurance.

***Conclusions:*** Irrespective of race/ethnicity, Medicaid recipients with OAG are receiving substantially less glaucoma testing compared with persons with commercial health insurance. Disparities in testing are observed across all races/ethnicities but were most notable for blacks. These findings are particularly disconcerting because blacks are more likely than whites to go blind from OAG and there are disproportionately more blacks in Medicaid. Efforts are needed to improve the quality of glaucoma care for Medicaid recipients, especially racial minorities. *Ophthalmology 2017;■:1–7 © 2017 by the American Academy of Ophthalmology*

Open-angle glaucoma (OAG) disproportionately affects racial minorities, including blacks, Latinos, and Asian Americans.[1–5] Compared with whites, racial minorities are also more likely to develop vision loss and experience blindness from OAG.[6–8] Despite the higher prevalence of OAG and greater disease burden on racial minorities, past studies have demonstrated substantial gaps in the monitoring of racial minorities with OAG to assess for disease progression[9] and prior research found that fewer racial minorities than expected receive treatment for this sight-threatening disease.[10] Past studies comparing glaucoma care by race have focused on groups of patients with Medicare or commercial health insurance.[1–4,9,10] To the best of our knowledge, researchers have yet to assess for disparities in glaucoma care among socioeconomically disadvantaged persons, such as those who are enrolled in Medicaid, compared with those with other types of health insurance.

Medicaid is the largest health insurer for low-income individuals, covering nearly 70 million Americans, which is approximately 15% of all persons in the United States who have health insurance.[11] With the passage of the Patient Protection and Affordable Care Act, the number of Medicaid beneficiaries has increased in recent years.[12] Although little is known regarding utilization of glaucoma care services among those with Medicaid relative to persons with other forms of health insurance, past studies that have compared utilization of other health care services, such as mammograms, Papanicolaou smears, and prostate-specific antigen tests to check for cancer have demonstrated



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that Medicaid recipients receive fewer of these screening tests than persons with other types of health insurance.[13,14] Likewise, Medicaid recipients tend to have worse health outcomes, such as lower survival rates from lymphoma,[15] lower resection rates, and higher mortality rates owing to liver metastases from colorectal cancer,[16] and receive fewer surgical interventions for resectable pancreatic cancer compared with those with other health insurance types.[17]

The purpose of this study is to compare Medicaid recipients who were newly diagnosed with OAG with others with commercial health insurance and to determine whether the type of health insurance a patient possesses affects the likelihood of undergoing glaucoma testing to monitor for disease progression, as recommended by the American Academy of Ophthalmology's Preferred Practice Pattern guidelines.[18] Moreover, we sought to learn whether racial disparities in glaucoma management documented previously for persons with other forms of health insurance also exist for patients enrolled in Medicaid, and if so, whether there are greater or fewer disparities in glaucoma care for whites, blacks, and Latinos with Medicaid vs. enrollees of the same race who possess commercial health insurance.

## Methods

### Data Sources

Data for these analyses came from 2 sources, the Medicaid Analytic Extract (MAX) and the Clinformatics DataMart (OptumInsight, Eden Prairie, MN) databases.

**Medicaid Analytic Extract.** The MAX database contains de-identified health care claims data for persons in all 50 state-run Medicaid programs and Washington, DC. Researchers have used the Medicaid MAX dataset to study health care service utilization and outcomes of Medicaid recipients for other conditions.[19,20] For each enrollee, we had access to all medical claims for ocular and nonocular conditions, as identified based on International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) billing codes,[21] and all visits and diagnostic and therapeutic procedures as identified based on Current Procedural Terminology (CPT),[22] 4th edition, and Healthcare Common Procedure Coding System billing codes from January 1, 2005, to December 31, 2012. In addition, the Personal Summary file has data on date of birth, sex, race/ethnicity, number of months of Medicaid eligibility in a given year, and most recent 5-digit ZIP code of residence for each enrollee.

**Clinformatics DataMart Database.** The Clinformatics DataMart database contains detailed de-identified records of enrollees in a large U.S. managed-care network. The data available include beneficiaries receiving any form of eye care from January 1, 2001, through December 31, 2014. To make the data comparable to those with Medicaid, we restricted our analyses to data from 2005 through 2012. This subset of beneficiaries had ≥1 ICD-9-CM code for any eye-related diagnosis (360−379.9) or CPT-4 code for any eye-related visits or diagnostic or therapeutic procedures (65091−68899 or 92002−92499), or any other claims submitted by an ophthalmologist or optometrist during the beneficiary's time in the medical plan. Similar to data from MAX, the Clinformatics DataMart contains information on medical claims for all ocular and nonocular conditions and demographic information (age, sex, race/ethnicity) for each enrollee. Both datasets also contained information on the types of health care providers performing the services. The data from both sources were de-identified before our licensing it and the study was approved by the University of Michigan Institutional Review Board.

### Participant Selection

We identified white, black, and Hispanic/Latino enrollees aged ≥40 years in both datasets who had OAG diagnoses (ICD-9-CM codes 365.1, 365.10, 365.11, 365.12, and 365.15). As the objective was to evaluate diagnostic testing among those with newly diagnosed OAG, enrollees with 1 or more pre-existing OAG diagnosis identified during a 2-year look-back period were excluded. We also required ≥1 confirmatory OAG diagnosis on a later date to help assure that the enrollees were not simply miscoded on 1 visit with this condition. Enrollees who were not continuously enrolled in each respective plan for at least 39 consecutive months (24 months before the initial OAG diagnosis and 15 months afterward) were excluded because they may have undergone testing during the times they were not enrolled in the plan. Medicaid enrollees with dual enrollment in Medicare or with managed care were excluded. Those with other forms of glaucoma and glaucoma suspects were not included in these analyses.

### Receipt of Glaucoma Testing

The outcome of interest was receipt of visual field (VF) testing (CPT 92081, 92082, and 92083), fundus photography (FP) (CPT 92250), or other ocular imaging (OOI) (CPT 92133, 92135) during the 15 months after initial OAG diagnosis. Other ocular imaging includes ocular coherence tomography, confocal scanning laser ophthalmoscopy, and scanning laser polarimetry. The American Academy of Ophthalmology Preferred Practice Patterns guidelines for primary OAG recommend receipt of perimetry and careful evaluation of the optic nerve at least once every 12 months.[18] As others have done previously,[23] we added 3 additional months to account for enrollees who may have needed to reschedule their annual appointments to provide ample time for testing to take place. This 15-month period did not include the date of initial OAG diagnosis.

### Analyses

Statistical analyses were performed using SAS software, version 9.4 (SAS Institute, Cary, NC) and R, version 3.3.1 (R Foundation for Statistical Computing, Vienna, Austria). Enrollees' characteristics were summarized for the entire sample using frequencies and percentages for categorical variables and means and standard deviations (SD) for continuous variables. The proportion of enrollees undergoing ≥1 of a given diagnostic test (or no testing of any type) in the 15 months after initial OAG diagnosis was determined for enrollees in the 2 insurance plans. Comparisons of these proportions were performed using the Pearson chi-square test. For those who had no record of any glaucoma testing, we checked to determine what proportion had and did not have visits to eye care professionals (ophthalmologist or optometrist) during that 15-month time period.

**Multivariable Logistic Regression.** Multivariable logistic regression models were created to determine patient-level factors affecting the odds of undergoing each type of glaucoma test (or no testing of any type) in the 15-month time interval after the initial OAG diagnosis. The primary patient-level covariates of interest in the model were insurance type (Medicaid vs. commercial) and race/ethnicity (white, black, or Latino/Hispanic). Other covariates included in the models as main effects were age at initial OAG diagnosis; calendar year of initial OAG diagnosis; sex; comorbid ocular diseases including age-related macular degeneration, cataract, macular edema, other conditions affecting the optic nerve that