

## Supplemental Online Content

Oke I, Lutz SM, Hunter DG, Galbraith AA. Use and costs of Instrument-based Vision Screening for US Children 12 to 36 Months. *JAMA Pediatr*. Published online May 22, 2023. doi:10.1001/jamapediatrics.2023.0808

### **eMethods.**

This supplemental material has been provided by the authors to give readers additional information about their work.

## **eMethods**

### A) Study population:

Children were included in the study if they were between 12 and 36 months of age on 01/01/2018 and enrolled in an employer-sponsored insurance plan in the IBM MarketScan Commercial Claims and Encounters Database. The IBM MarketScan database contains de-identified, patient-specific health care utilization data from reimbursed health insurance claims for employees and their dependents of over 250 medium and large employers and health plans. These data cover approximately 30 million covered employees and family members per year. We excluded children with less than 12 months of continuous enrollment (with a 45-day grace period) and those enrolled in a capitated insurance plan (where a fixed amount of money per patient per unit of time is paid in advance to the physician for the delivery of health care services), as individual preventive care claims may be infrequently used by practitioners in a capitated reimbursement structure. In addition, we excluded children without any preventive care visits in the 2018 calendar year and those with an unknown core-based statistical area (CBSA) of residence as this would preclude analysis of local cost-related factors.

### B) Outcomes and predictors:

The data collected for each child included demographics and details of vision screening-related encounters. Vision screening encounters were identified using Current Procedural Terminology (CPT) codes for instrument-based screening (CPT 99174 and

99177). Instrument-based vision screening involves the use of a portable device to passively detect amblyogenic risk factors, such as refractive error or strabismus, without requiring the child to read an eye chart.

The main predictors in this investigation included the median practitioner payment for instrument-based vision screening encounters and the percentage of patients with out-of-pocket expenses within the child's CBSA of residence. When an individual obtains a health care service that is covered by the insurance plan, the out-of-pocket expense is the amount paid by the individual to the practitioner (which may include the deductible, copayment, or coinsurance amounts). The deductible is the amount of money that an individual must pay before an insurance company will start to pay for health care services. The copayment is the fixed amount that an individual must pay for a covered health care service and the coinsurance is the percentage of the remaining cost that an individual must pay. The payment, or reimbursement, to a practitioner for a specific service includes the amount paid out-of-pocket by the patient and the amount paid by the insurance company to the practitioner. These variables were calculated at the CBSA level as an estimate of the potential payment amount for the child's practitioner and potential out-of-pocket cost for the child's family for instrument-based vision screening, given that the actual individual payment amount or out-of-pocket cost would only be available in the dataset for children who received screening. The practitioner payment and frequency of out-of-pocket expenses at the CBSA level were reported as continuous variables and categorized into quartiles. All financial values are reported as 2018 US dollars.

Other predictors included age, sex, geographic region, type of insurance plan, number of preventive care visits, and type of vision screening device. Age was categorized into 1 to <2 years of age vs. 2 to <3 years of age at the beginning of the study interval. Geographic region was categorized into one of four US census regions (South, Northeast, Midwest, and West) based on the state of residence. The type of insurance plan was categorized as high deductible versus non-high deductible health plan. High deductible health plans require that enrollees pay out-of-pocket for the costs of health care up to an annual deductible amount, usually more than \$1000 for an individual and more than \$2000 per family. The monthly premium is usually lower, but individuals pay more health care costs (deductible) before the insurance company pays its share. Preventive visits were identified using codes for new patient (CPT 99381-99383) and established patient (CPT 99391-99393) pediatric preventive medicine services, and categorized into one versus more than one visit within the calendar year. In the US, preventive visits (also known as well-child checks) are recommended to occur at age 12, 15, 18, 24, and 36 months with a primary care practitioner, at which time vision and other preventive screenings usually occur, along with growth measurements, and vaccinations. The predominant type of screening device used in each CBSA was determined using the billing codes corresponding to instrument-based vision screening with on-site interpretation (CPT 99177) and off-site interpretation (CPT 99174). On-site interpretation refers to the use of a device that provides real-time analysis and report of results, whereas off-site interpretation refers to devices which transmit data to a remote

facility where the analysis and report are compiled and sent back to the practitioner electronically.

### C) Statistical Analysis

We used medians and interquartile ranges (IQR) to describe the nationwide and state-level vision screening utilization, practitioner payment, and out-of-pocket expenses. The characteristics of children who did and did not receive instrument-based vision screening within one year were compared using chi-square tests. Logistic regression models were used to identify the factors associated with receipt of instrument-based screening, with all analyses performed at the individual-level. The multivariable model included age, sex, type of insurance plan, geographic region, number of preventive visits, and the type of device, median practitioner payment, and frequency of patient out-of-pocket expenses for vision screening in the CBSA of residence. We reported odds ratios (OR) with corresponding 95% confidence intervals (CI). Statistical analyses were performed using R, version 4.2.0 (R Core Team, 2022), with significance defined as a two-tailed p-value < .05.

D) Flowchart of study inclusion and exclusion criteria

