

# **Cost-effectiveness analysis of geographically-based teleretinal diabetic retinopathy screening policies for urban and rural populations**

## **Purpose:**

Geographically-based screening policies for diabetic retinopathy (DR) can be effective in developing teleretinal imaging (TRI) guidelines while identifying patients with limited geographic access to eye care. This study conducts cost-effectiveness analysis of different screening policies for urban and rural diabetic patients in Western Pennsylvania.

## **Methods:**

A Monte Carlo simulation model was used to evaluate the cost-effectiveness of 2 standardized screening policies (annual clinic-based screening (ACS) and annual TRI-based screening (ATRI)) and a personalized TRI-based screening policy (PTRI) for both urban and rural cohorts. PTRI was generated by a previously developed mathematical model that autonomously makes semi-annual screening recommendations based on each patient's disease progression and compliance (Dorali et al. IOVS 2022; 63(7)). For each policy, hypothetical urban and rural cohorts of 50,000 patients were simulated and lifetime QALYs and costs were collected for each patient. TRI compliance rates were derived from electronic medical records. Compliance with clinic-based screening was selected from literature-based values (12-45% for rural patients and 50-65% for urban patients).

## **Results:**

For a base case urban cohort with an A1C level of 7% and entering age of 40, costs per QALY gain (CPQ) for ACS, ATRI, and PTRI were \$744.93±1.57, \$792.38±1.64, and \$714.60±1.56, respectively; PTRI produced more cost saving than ACS with the same QALY gain (See Fig 1). For a base case rural cohort, CPQ for ACS, ATRI, and PTRI were \$869.15±1.80, \$819.24±1.88, and \$761.51±1.42, respectively; both ATRI and PTRI dominated ACS in QALY gains and cost saving (Fig 1). PTRI recommended TRI more to rural patients (94.13±0.01%) than to urban patients (87.20±0.02%). For the rural cohort, the minimum average TRI compliance rate such that ATRI is more cost-effective than ACS was 56% (Fig 2).

## **Conclusions:**

TRI-based screening was found more beneficial for rural patients. PTRI was found dominant in QALY gain and cost saving for both urban and rural cohorts against standardized policies. These findings suggest that TRI is best utilized when location-specific factors such as geographic access to care or TRI compliance are considered.

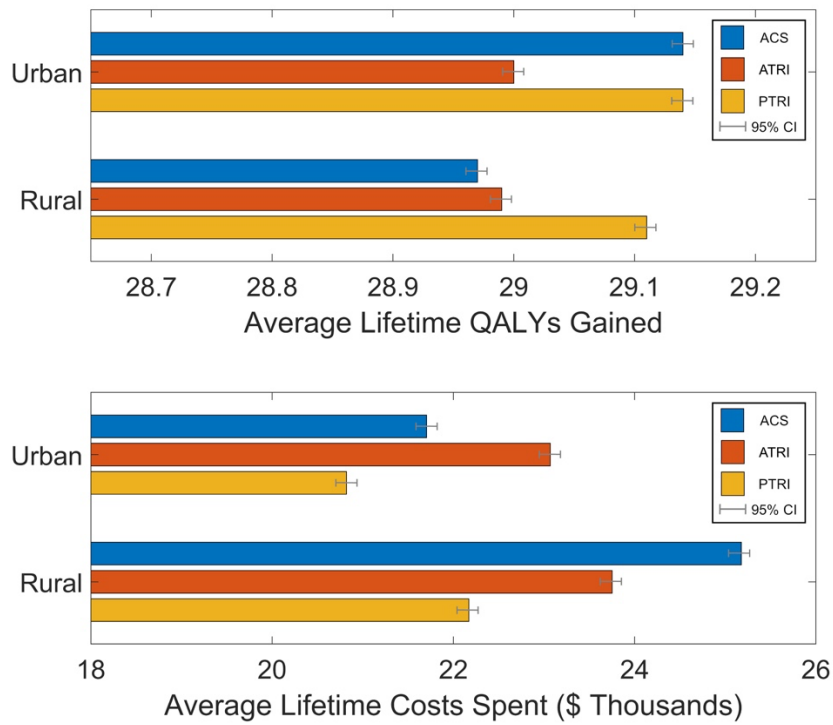


Fig 1: Average lifetime QALYs and costs for different screening policies for rural patients

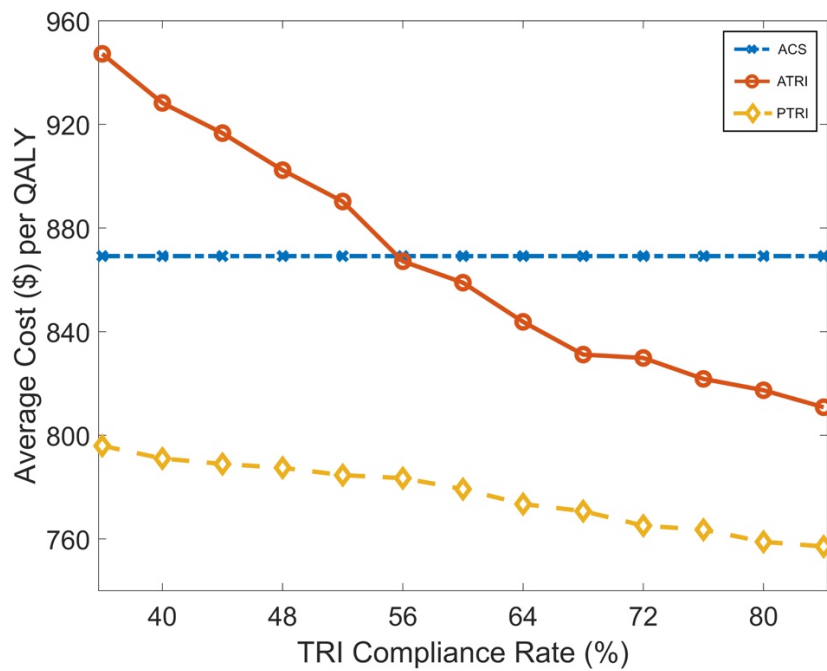


Fig 2: Average CPQ for different TRI compliance rates

Laymen abstract:

Patients in different locations are subject to different levels of geographic access to eye care. This study examines cost-effectiveness of various diabetic retinopathy screening policies for urban and rural patients who have different screening compliance rates and screening costs relating to distance to eye clinics and transportation burden. Our results indicate that the cost-effectiveness of diabetic retinopathy screening increases as telehealth-based screening is personalized to account for location-specific characteristics.