



## Cost of a Community-Based Diabetic Retinopathy Screening Program

Diabetes Care 2014;37:e236–e237 | DOI: 10.2337/dc14-0834

Margaret M. Byrne,<sup>1,2,3</sup>  
Dorothy F. Parker,<sup>2</sup>  
Stacey L. Tannenbaum,<sup>2</sup>  
Manuel A. Ocasio,<sup>1</sup> Byron L. Lam,<sup>4</sup>  
Ingrid Zimmer-Galler,<sup>5</sup> and David J. Lee<sup>1,2,4</sup>

The prevalence of diabetes in the U.S. has steadily increased over the last few decades (1). Although adults with diabetes are at increased risk for ocular disease and blindness, primarily related to diabetic retinopathy (2), many are not evaluated for retinopathy. Barriers to vision-screening adherence among adults with diabetes include the perception—and often the reality—that examinations are expensive and a poor understanding of the increased risk of vision loss (3). The goal of this study was to determine the costs of a community-based program to screen adults for diabetic retinopathy.

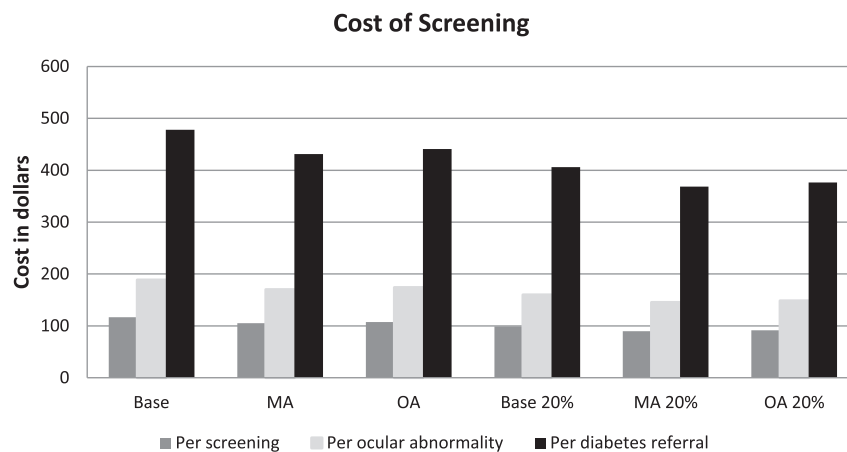
In this study, free ocular health screening was offered over a 17-month period at a community health center in a low socioeconomic area. Fundus photographs were taken, uploaded to a HIPPA-compliant secure Web site, and reviewed for any clinical pathology and specifically for diabetic retinopathy. We collected information on all costs of the screening program. Costs were assessed in three ways in a base model: the costs per participant for 1) screening, 2) detection of ocular abnormalities, and 3) referrals for diabetic retinopathy treatment. Sensitivity analyses were conducted varying the wages of ocular technicians and estimates of time devoted to research versus screening.

Overall, 607 adults with diabetes were screened. The sample was 65.6% female, 45.5% non-Hispanic black or Haitian, and 52.2% Hispanic. The average age was 55.8 years (SD 9.2). Most (78.4%) did not have insurance, 45.2% had not had an eye exam in the last 2 years, and 10.9% reported never having an eye exam. Based on the reading of the fundus photographs, 61.8% were identified with some clinical pathology and 24.4% were referred with diabetic retinopathy. More Hispanics (12.3%) than non-Hispanic blacks (9.5%) and

more males (14.9%) than females (8.8%) had never had an eye exam. The uninsured were much less likely to have had previous screening than those with insurance (5.3 vs. 12.5%).

Over the 17 months of the program, the total cost was \$91,294, with staff time (\$53,388) being approximately 58% of the total cost of the screening intervention. Start-up costs were 31% of the program costs.

In our base model, the cost per screening was \$116, the cost per ocular abnormality identified was \$188, and



**Figure 1**—Three measures of costs were calculated. Base is base model with actual staff salaries and initial estimates of research vs. nonresearch work time. MA adjusts for medical assistant (CareerBuilder.com) wages and OA for optometric assistant (Bureau of Labor Statistics) wages. “20%” indicates a 20% reduction in the estimate of research-related effort.

<sup>1</sup>Department of Public Health Sciences, University of Miami Miller School of Medicine, Miami, FL

<sup>2</sup>Sylvester Comprehensive Cancer Center, University of Miami Miller School of Medicine, Miami, FL

<sup>3</sup>Department of Surgery, University of Miami Miller School of Medicine, Miami, FL

<sup>4</sup>Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, Miami, FL

<sup>5</sup>Wilmer Eye Institute, Johns Hopkins University, Baltimore, MD

Corresponding author: Margaret M. Byrne, mbyrne2@med.miami.edu.

© 2014 by the American Diabetes Association. Readers may use this article as long as the work is properly cited, the use is educational and not for profit, and the work is not altered.

the cost per diabetic retinopathy referral was \$478 (Fig. 1). In sensitivity analyses, costs were reduced by 7–23% as wages from national databases for ocular technicians were less than the wages paid to our staff and our original estimates of time spent on research versus the screening program were conservative.

Very few retinopathy screening studies, including those on the cost of screening (4,5), have been conducted in community settings. The incidences of ocular abnormalities and diabetic retinopathy in this low socioeconomic population were very high and the cost of community-based screening was slightly over \$100 per individual screened and less than \$500 for preliminary identification of diabetic retinopathy. In addition, many patients with diabetes had never had an eye exam. Our findings illustrate the tremendous need for and great potential

of community-based diabetic retinopathy surveillance programs.

**Funding.** This study was funded by the Centers for Disease Control and Prevention through cooperative agreements with the University of Miami (1U58DP002652), Johns Hopkins University (5U58DP002653), the University of Alabama at Birmingham (5U58DP002651), and the Wills Eye Hospital (1U58DP002655).

**Duality of Interest.** No potential conflicts of interest relevant to this article were reported.

**Author Contributions.** M.M.B. participated in designing the study, analyzed the data, and drafted the manuscript. D.F.P. and M.A.O. participated in designing the study, implemented the study, and edited the manuscript. S.L.T. participated in drafting the manuscript. B.L.L. and D.J.L. had the original idea, developed hypotheses, and developed the study design. I.Z.-G. edited the manuscript. All authors reviewed the manuscript. M.M.B. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

**Prior Presentation.** Parts of this study were presented in abstract form at the 2013 Association

for Research in Vision and Ophthalmology Annual Meeting, Seattle, WA, 4–7 May 2013 and the 141st Annual Meeting of the American Public Health Association, Boston, MA, 2–6 November 2013.

## References

1. American Diabetes Association. *Statistics about Diabetes: Data from the 2011 National Diabetes Fact Sheet*. Available from <http://www.diabetes.org/diabetes-basics/diabetes-statistics/>. Accessed 29 January 2014
2. Ciulla TA, Amador AG, Zinman B. Diabetic retinopathy and diabetic macular edema: pathophysiology, screening, and novel therapies. *Diabetes Care* 2003;26:2653–2664
3. Dervan E, Lillis D, Flynn L, Staines A, O'Shea D. Factors that influence the patient uptake of diabetic retinopathy screening. *Ir J Med Sci* 2008;177:303–308
4. Porta M, Rizzitiello A, Tomalino M, et al. Comparison of the cost-effectiveness of three approaches to screening for and treating sight-threatening diabetic retinopathy. *Diabetes Metab* 1999;25:44–53
5. James M, Turner DA, Broadbent DM, Vora J, Harding SP. Cost effectiveness analysis of screening for sight threatening diabetic eye disease. *BMJ* 2000;320:1627–1631