



Frequency and predictors of missed visits to primary care and eye care providers for annually recommended diabetes preventive care services over a two-year period among U.S. adults with diabetes

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ABSTRACT

This paper examines the patterns of visits to primary care and eye care providers for annually recommended diabetes preventive care services over a two-year period in a sample of U.S. adults aged 18 years and older with diabetes drawn from the 2008–2013 Medical Expenditure Panel Survey-Household Component ($n = 3982$). The four-category outcome variable was defined based on the four possible combinations of whether an individual missed an annual visit to a primary care provider for preventive care services in at least one year over the two-year period and whether the individual missed an annual visit to an eye care provider in at least one year over this period. Descriptive statistics and a multinomial logistic regression model were estimated. 51.9% of the sample missed an annual visit to a primary care or eye care provider for preventive care services over a two-year period. Although 48.8% of the sample missed at least one annual visit to an eye care provider, 85.6% of these individuals *did* visit a primary care provider for preventive care services during the year they did not visit an eye care provider. This suggests that primary care-based screening for diabetic retinopathy could reach most individuals who do not receive regular eye care. Regression results particularly relevant for potential interventions were that missing annual visits was significantly more likely for individuals without health insurance or a usual source of healthcare and for those who were not receiving diabetes treatments and did not have or were not aware of having diabetes-related complications.

1. Introduction

Approximately 12.3% of the U.S. population aged 20 and older has diabetes (Menke et al., 2015). Complications of diabetes are extensive and include cardiovascular disease, diabetic retinopathy, glaucoma, cataracts, diabetic kidney disease, neuropathy, and increased severity of periodontal disease and influenza (American Diabetes Association (ADA), 2015).¹ Diabetes is the 7th leading cause of death in the U.S. and it is the leading cause of kidney failure, lower limb amputations, and adult-onset blindness in the U.S. (ADA, 2015). Many diabetes complications can be prevented or postponed through lifestyle modifications and medical interventions and the severity of many complications can be reduced through early detection and timely treatment (ADA, 2015). As a result, the ADA recommends that all individuals with diabetes annually receive a comprehensive foot examination, lipid measurement, dilated eye examination, urinary albumin screening, flu vaccination, and dental exam, and at least two hemoglobin A1c

(HbA1c) tests (ADA, 2015). The ADA also recommends blood pressure measurement at every routine visit (ADA, 2015). Recent estimates find that adherence to these preventive care service recommendations is suboptimal; the percentage of U.S. adults with diabetes who received these services over the course of a year ranged from 60% for flu vaccinations to 88.2% for lipid measurement (Ali et al., 2013).

Adherence over time to annual diabetes preventive care service recommendations by an individual with diabetes has implications for the individual's health and longitudinal adherence patterns among the group of individuals with diabetes have implications for the need for and targeting of interventions to increase recommendation adherence (ADA, 2015). Four prior studies have looked at longitudinal adherence patterns among U.S. adults with diabetes; three of these studies focused exclusively on the receipt of eye examinations (Fitch et al., 2015; Gregg et al., 2010; Lee et al., 2003; Sloan et al., 2014). These studies all found that a substantially higher percentage of adults with diabetes missed an annually recommended service during at least one year over a period of

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¹ Abbreviations used in this paper: American Diabetes Association (ADA), average marginal effects (AMEs), Diabetes Care Survey (DCS), diabetes primary care (DPC), diabetic retinopathy screening using telemedicine (DR telemedicine screening), hemoglobin A1c (HbA1c), Medical Expenditure Panel Survey-Household Component (MEPS-HC), Metropolitan Statistical Area (MSA)

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Table 1

Characteristics of adults with diabetes grouped by their pattern of visits to diabetes primary care and eye care providers for recommended diabetes preventive care services over a two-year period, MEPS-HC 2008–2013, $n = 3982$.

| | Sub-Sample: MISSED_BOTH 14.2% of full sample | Sub-Sample: MISSED_EYE 34.6% of full sample | Sub-sample: MISSED_DPC 3.1% of full sample | Sub-Sample: MISSED_NEITHER 48.1% of full sample |
|--|---|--|---|--|
| | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) |
| Health status and behaviors | | | | |
| Diabetes treatment | | | | |
| Insulin ^a , % | 21.9 (18.4, 26.0) | 24.6 (21.8, 27.7) | 25.7 (16.7, 37.4) | 35.1 (32.4, 38.0) |
| Oral medicine ^a , % | 69.1 (64.0, 73.8) | 83.7 (81.1, 86.1) | 79.3 (68.7, 86.9) | 79.7 (77.0, 82.2) |
| Diet ^a , % | 71.8 (66.7, 76.3) | 79.9 (77.3, 82.2) | 80.5 (69.8, 88.0) | 82.5 (80.1, 84.7) |
| Diabetes-related eye probs. ^a , % | 19.1 (15.5, 23.2) | 14.8 (12.7, 17.0) | 23.0 (15.3, 33.1) | 22.7 (20.3, 25.4) |
| Diabetes-related kidney problems ^a , % | 9.2 (6.7, 12.5) | 8.9 (7.2, 11.0) | 4.7 (2.2, 9.8) | 11.7 (9.9, 13.7) |
| High cholesterol, % | 57.7 (52.4, 62.9) | 71.1 (68.0, 70.3) | 70.3 (60.8, 79.8) | 75.7 (72.8, 78.5) |
| High blood pressure, % | 68.9 (64.2, 73.7) | 74.5 (71.5, 77.6) | 81.7 (72.6, 90.7) | 77.1 (74.4, 79.7) |
| Coronary heart disease, % | 12.5 (9.3, 15.8) | 15.8 (13.5, 18.2) | 18.9 (10.1, 27.6) | 20.4 (17.8, 23.0) |
| Functional limitations, % | 33.7 (29.1, 38.2) | 43.5 (40.0, 47.0) | 42.5 (31.7, 53.2) | 43.3 (40.3, 46.2) |
| Obese ^a , % | 55.5 (50.6, 60.2) | 57.9 (54.7, 61.1) | 58.6 (47.2, 69.1) | 57.5 (54.3, 60.7) |
| Smoker at baseline ^a , % | 25.2 (21.3, 29.6) | 19.6 (17.1, 22.4) | 23.0 (14.8, 33.9) | 10.8 (9.2, 12.7) |
| Depressed ^a , % | 13.2 (10.1, 17.0) | 12.2 (10.4, 14.2) | 15.0 (7.9, 26.5) | 9.6 (8.0, 11.5) |
| Demographic and socioeconomic characteristics | | | | |
| Age | | | | |
| Age, mean | 54.6 (53.2, 55.9) | 59.0 (58.0, 59.8) | 60.6 (58.3, 62.9) | 62.6 (61.7, 63.4) |
| Age 18–34, % | 7.2 (4.9, 9.5) | 3.2 (2.2, 4.2) | 2.8 (0.4, 5.2) | 2.5 (1.6, 3.5) |
| Age 35–49, % | 27.5 (23.1, 31.9) | 21.3 (18.9, 23.7) | 11.1 (4.9, 17.7) | 12.1 (10.3, 14.0) |
| Age 50–64, % | 40.9 (35.6, 46.2) | 41.0 (37.7, 44.3) | 54.4 (43.8, 65.0) | 38.6 (35.5, 41.7) |
| Age 65+, % | 24.4 (19.8, 29.1) | 34.5 (31.0, 37.9) | 31.7 (21.4, 42.1) | 46.7 (43.3, 50.1) |
| Female, % | 45.6 (40.8, 50.3) | 52.7 (49.5, 55.9) | 57.1 (46.4, 67.9) | 50.7 (48.2, 53.3) |
| Family income-to-poverty ratio | | | | |
| ≤ 1, % | 21.7 (18.0, 26.0) | 17.5 (15.1, 19.9) | 13.4 (7.9, 21.9) | 12.1 (10.5, 13.8) |
| > 1 and ≤ 2, % | 23.5 (19.4, 27.6) | 22.4 (19.4, 25.5) | 27.0 (17.6, 36.3) | 19.7 (17.3, 22.2) |
| > 2 and ≤ 4, % | 30.6 (25.9, 35.3) | 30.8 (27.3, 34.3) | 29.1 (18.4, 39.9) | 29.1 (26.5, 31.7) |
| > 4, % | 24.2 (19.3, 29.1) | 29.3 (26.0, 32.7) | 30.5 (19.2, 41.8) | 39.1 (35.6, 42.7) |
| Education | | | | |
| Less than high school, % | 24.9 (21.0, 28.7) | 22.6 (19.7, 25.5) | 25.8 (16.5, 35.1) | 16.1 (14.1, 18.0) |
| High school or GED, % | 61.9 (57.3, 66.5) | 59.0 (55.6, 62.4) | 60.7 (49.6, 71.7) | 59.3 (56.1, 62.4) |
| Attended college, % | 12.0 (8.5, 15.4) | 17.7 (15.1, 20.2) | 13.5 (6.2, 20.9) | 24.4 (21.3, 27.4) |
| Missing, % | 1.2 (0.4, 2.1) | 0.7 (0.3, 1.3) | 0.0 | 0.3 (0.0, 0.6) |
| Married, % | 48.3 (43.1, 53.5) | 54.6 (51.3, 57.9) | 63.5 (53.3, 73.7) | 60.6 (57.8, 63.4) |
| Family size, mean | 2.7 (2.5, 2.9) | 2.4 (2.3, 2.5) | 2.3 (2.0, 2.5) | 2.2 (2.2, 2.3) |
| Employed, % | 45.6 (40.3, 50.8) | 43.8 (40.3, 47.3) | 35.7 (24.0, 47.3) | 40.1 (37.0, 43.2) |
| Primarily speak English at home, % | 82.8 (78.5, 87.2) | 87.9 (85.5, 90.4) | 89.3 (84.2, 94.5) | 90.8 (89.2, 92.4) |
| Race/ethnicity | | | | |
| Hispanic, % | 22.7 (17.7, 27.8) | 15.9 (12.8, 19.0) | 15.1 (8.5, 21.7) | 10.6 (8.7, 12.5) |
| Non-Hispanic White, % | 53.1 (47.6, 58.5) | 61.3 (57.6, 65.3) | 64.1 (54.7, 73.6) | 70.1 (67.4, 73.1) |
| Non-Hispanic Black, % | 18.3 (14.4, 22.1) | 16.0 (13.1, 19.0) | 15.7 (10.2, 21.3) | 14.1 (1.1, 16.2) |
| Asian, % | 3.2 (1.8, 4.7) | 4.9 (3.5, 6.3) | 4.0 (0.6, 7.3) | 3.8 (2.7, 5.0) |
| American Indian or Alaska Native, % | 0.5 (– 0.2, 1.1) | 1.0 (0.1, 1.9) | 0.5 (– 0.5, 1.4) | 0.9 (0.2, 1.6) |
| Non-Hispanic other, % | 2.2 (0.4, 4.0) | 0.9 (0.2, 1.6) | 0.6 (– 0.6, 1.8) | 0.5 (0.1, 0.9) |
| | Sub-Sample: MISSED_BOTH | Sub-Sample: MISSED_EYE | Sub-sample: MISSED_DPC | Sub-Sample: MISSED_NEITHER |
| | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) | Weighted percentage or mean (95% CI) |
| Access to health care | | | | |
| Health insurance | | | | |
| No health insurance, % | 22.1 (17.8, 26.4) | 9.9 (8.3, 11.5) | 9.1 (4.3, 13.8) | 3.0 (2.3, 3.7) |
| Public insurance only, not including Medicare, % | 13.7 (10.5, 16.8) | 9.1 (7.3, 10.9) | 12.9 (6.1, 19.7) | 7.0 (5.5, 8.4) |
| Medicare only, % | 12.2 (9.0, 15.4) | 18.9 (16.1, 21.8) | 16.9 (7.6, 26.1) | 21.6 (19.2, 24.0) |
| Medicare and Medicaid, % | 8.0 (5.8, 10.3) | 8.1 (6.4, 9.7) | 7.3 (2.7, 11.9) | 7.3 (5.9, 8.7) |
| Medicare and private ins., % | 9.9 (6.5, 13.2) | 14.8 (12.2, 17.3) | 17.7 (8.7, 26.8) | 24.8 (22.1, 27.6) |
| Private insurance only, % | 34.1 (28.6, 39.7) | 39.1 (35.9, 42.6) | 36.1 (24.5, 47.7) | 36.3 (33.1, 39.4) |
| Usual source of health care | | | | |
| No usual source of care, % | 18.0 (14.0, 21.9) | 5.9 (4.6, 7.2) | 5.0 (1.1, 8.9) | 4.2 (3.0, 5.5) |
| Provider is usual source, % | 39.6 (34.7, 44.5) | 51.2 (47.5, 54.8) | 52.9 (42.0, 63.7) | 54.6 (51.3, 57.9) |
| Facility is usual source, % | 41.5 (37.0, 46.2) | 42.2 (38.6, 45.9) | 41.4 (30.4, 52.4) | 40.5 (37.1, 43.8) |
| Missing, % | 0.9 (0.1, 1.7) | 0.7 (0.2, 1.2) | 0.7 (– 0.7, 2.2) | 0.7 (0.2, 1.2) |
| Wear glasses, % | 70.8 (66.0, 75.5) | 74.6 (71.6, 77.6) | 86.2 (79.4, 93.0) | 84.2 (82.1, 86.3) |
| Area of residence | | | | |

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