



To: Pacific Dental Services Foundation.
From: Avalere Health
Date: January 4, 2016
Re: Evaluation of Cost Savings Associated with Periodontal Disease Treatment Benefit

Summary

Pacific Dental Services Foundation asked Avalere Health to estimate the cost or savings to the Medicare program of a new benefit covering the initial and ongoing treatment of periodontal disease for beneficiaries with diabetes, coronary artery disease (heart disease), or cerebrovascular disease (stroke). A growing body of academic literature and retrospective medical claims studies support a link between oral health, periodontal disease treatment, reduced medical costs, and improved wellbeing, especially for individuals with one of the three chronic conditions included in this evaluation.

We drew from these and other data sources to construct an estimate of Medicare fee-for-service spending for individuals with periodontal disease and chronic conditions. Our estimate assumes that Medicare will begin paying for periodontal treatment in 2016 through a new Medicare Part B benefit, but limit coverage to individuals with one of the three conditions noted above.

We estimate providing a periodontal disease treatment benefit will produce a savings of \$63.5 billion over the period 2016 to 2025 and should continue long-term. This savings reflects new costs of approximately \$7.2 billion from covering periodontal treatment for Medicare beneficiaries with one of the three target chronic conditions. This new spending will be offset by an estimated \$70.7 billion reduction in Medicare spending, largely related to fewer hospitalizations and emergency room visits.

Table 1: Estimated Impact on Medicare Program Spending from Coverage of Periodontal Treatment (\$ billions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
Periodontal Benefit	0.5	0.5	0.6	0.5	0.6	0.7	0.8	0.9	1.0	1.1	7.2
Medical Savings	(1.1)	(2.8)	(4.1)	(5.4)	(6.4)	(7.5)	(8.7)	(10.0)	(11.5)	(13.3)	(70.7)
Total Impact	(0.5)	(2.3)	(3.5)	(4.8)	(5.7)	(6.8)	(7.9)	(9.2)	(10.6)	(12.2)	(63.5)

Background

Periodontal disease occurs when bacteria and plaque accumulate on and underneath the gums, causing inflammation, infection, and possible damage to bone and connective tissue in the mouth. Approximately 45 percent of adults aged 30 years and older have some form of periodontal disease.¹ The prevalence of the disease increases with age, as an estimated 66 percent of adults 65 years and older have periodontal disease.² There also appear to be associations between sex, race, and socioeconomic status, with higher prevalence rates of periodontal disease for male, Hispanic & African American, and lower socioeconomic level populations.³

Typically, researchers quantify the severity of periodontal disease by measuring the amount of loss of attachment of the gums. Larger attachment loss indicates a more serious case of the disease. Approximately 20 percent of the population with any periodontal disease aged 30 years and older have severe periodontitis, defined as loss of 6 millimeters or greater.⁴ Because the disease is often asymptomatic until its later stages, individuals who do not receive regular dental care generally have unrecognized periodontitis until the condition progresses to the severe stage.⁵ Periodontitis is chronic in nature, although dental treatment (surgical and non-surgical) and ongoing maintenance care can control the infection and improve oral health.

While many non-elderly individuals have insurance coverage for dental care through an employer or public insurance program, traditional Medicare fee-for-service does not cover dental care for the elderly population. Therefore, approximately 70 percent of the elderly do not have dental insurance, with the remaining 30 percent gaining access through Medicare Advantage plans, employer-sponsored or self-purchased supplemental insurance, or Medicaid.⁶ The lack of dental benefits could be a barrier preventing elderly Americans from receiving dental care on a regular basis, including periodontal treatment.

Traditionally, there has been a systemic divide between providers and payers of dental care and other medical services. However, there is growing evidence that both types of health are intertwined. Several private insurers have launched efforts to integrate the two, seeing an opportunity to improve patient outcomes and reduce costs.⁷ Likewise, some Medicare Shared

¹ Eke, Paul I., Bruce A. Dye, Liang Wei, Gary D. Slade, Gina O. Thornton-Evans, Wenche S. Borgnakke, George W. Taylor, Roy C. Page, James D. Beck, and Robert J. Genco. "Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012." *Journal of Periodontology*: 611-22

² *ibid*

³ "Oral Health in America: A Report of the Surgeon General." U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.

⁴ Eke et al. "Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012."

⁵ "Oral Health in America"

⁶ "A State of Decay: Are Older Americans Coming of Age Without Oral Healthcare?" Oral Health America. 2014.

⁷ Snyder, A. "Oral Health and the Triple Aim: Evidence and Strategies to Improve Care and Reduce Costs." *State Health Policy Briefing* (National Academy for State Health Policy), 2015.

Savings Program (MSSP) providers have started including dental benefits in the belief that it may lead to lower medical costs.⁸

Published literature suggests associations between periodontal issues and a number of chronic diseases including diabetes, coronary artery disease (heart disease), and cerebral vascular disease (stroke) and researchers have identified periodontal disorders as a useful marker of cardiovascular disease.⁹ Research is ongoing and results continue to solidify the evidence of a biological link between periodontitis and these conditions.¹⁰ While much about these links remains unknown due to biological complexity and the limitations of research design and resources, data suggest that improving periodontal health may have a positive impact on health outcomes, at a minimum for patients with some common conditions. Retrospective studies of commercial insurance claims data showed that among people with periodontal disease, the patients who received periodontal treatment experienced lower medical costs than people without treatment.¹¹ These data provide a link between the potential benefit of periodontal treatment on improving care and reducing medical costs.

Assumptions & Methodology

Baseline Estimate for Medicare Costs

We first created a baseline estimate for the population enrolled in the Medicare fee-for-service program by projecting enrollment growth and per capita cost trends. Our assumptions for these projections relied on those published by the Medicare Boards of Trustees Annual Report and the Congressional Budget Office. We estimated medical costs and prevalence of chronic conditions using data obtained from the 2010 Chronic Condition Public Use Files provided by the Centers for Medicare & Medicaid Services (CMS). To ensure that we only counted individuals in this file once for purposes of our analysis, we first counted all people with diabetes, then people without diabetes but with heart disease, and finally people without diabetes or heart disease but with a history of stroke. We also assumed that the percentage of the total population with each of the chronic conditions we analyzed remained a steady proportion across all years in the analysis.

⁸ "Adding dentists to the team: ACO costs go down, care up". *Politico*. June 17, 2015.

⁹ Vedin, Ola, Emil Hagström, Dianne Gallup, Megan L. Neely, Ralph Stewart, Wolfgang Koenig, Andrzej Budaj et al. "Periodontal disease in patients with chronic coronary heart disease: Prevalence and association with cardiovascular risk factors." *European journal of preventive cardiology* 22, no. 6 (2015): 771-778.

¹⁰ Zhang, Boxi, Hazem Khalaf, Allan Sirsjö, and Torbjörn Bengtsson. "Gingipains from the periodontal pathogen *Porphyromonas gingivalis* play a significant role in regulation of Angiopoietin 1 and Angiopoietin 2 in human aortic smooth muscle cells." *Infection and immunity* (2015): IAI-00498.

¹¹ "Evidence of the Link between Periodontal Disease and Chronic Conditions." Memo from Avalere Health to Pacific Dental Services dated June 8, 2015.

Table 2: Estimated Medicare Enrollment and Costs for Target Chronic Conditions

Chronic Condition	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Diabetes											
Population (millions)	9.9	10.1	10.3	10.6	10.9	11.1	11.3	11.6	11.8	12.1	12.3
Avg. Medicare spending per person	\$ 15,847	15,888	16,191	16,734	17,331	17,994	18,709	19,473	20,259	21,089	22,110
Heart Disease											
Population (millions)	6.4	6.5	6.7	6.9	7.0	7.2	7.3	7.5	7.6	7.8	8.0
Avg. Medicare spending per person	\$ 14,524	14,559	14,835	15,332	15,875	16,477	17,128	17,823	18,537	19,291	20,220
Stroke											
Population (millions)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Avg. Medicare spending per person	\$ 16,526	16,557	16,861	17,424	18,021	18,688	19,407	20,174	20,961	21,788	22,817

Source: 2010 Medicare Chronic Conditions Public Use File; 2014 Medicare Trustees Report

Next, using a combination of studies and survey data, we developed estimates of periodontal disease prevalence and treatment rates to segment the current and future Medicare fee-for-service population by those who are not afflicted by periodontal disease, those who have the disease and are receiving treatment, and those who have the disease but are not receiving treatment. Based on data from the most recent National Health and Nutrition Examination Survey (NHANES), we estimate that 66 percent of the Medicare-aged population has periodontal disease.

Estimates of treatment for periodontal disease are more difficult to come by, given the current lack of coverage. NHANES suggests that nearly 72 percent of the aged population with periodontal disease had a dentist visit within the last 12 months; however, NHANES does not indicate if the individual received periodontal treatment during that visit, nor does it indicate whether the person was even aware of their periodontal status. Conversely, information from the Medicare Current Beneficiary Survey (MCBS) suggests that fewer than 5 percent of all visits to dentists by Medicare enrollees were for periodontal care. Likewise, data from the Medical Expenditure Panel Survey (MEPS) suggests that only 3 percent of the entire population who visited a dentist had periodontal related treatment.

We assume that 5 percent of the Medicare population with periodontal disease currently seek and receive treatment for their periodontal issues. While a much larger proportion of the beneficiaries in Medicare with periodontal disease visit dental professionals in a given year, the low rate of periodontal treatment during dentist visits, even for individuals with severe cases of periodontal disease, suggests a high percentage of Medicare enrollees are not receiving care for their periodontal disease.

Table 3: Estimates of Periodontal Disease Prevalence and Treatment among the Medicare Population

Measure	Value	Source
Any Periodontitis, age ≥ 65 years	70.1%	NHANES 2009-2010 *
	66.0%	NHANES 2011-2012 *
Severe Cases	11.0%	NHANES Combined 2009-2012 *
Moderate or Mild Cases	57.0%	NHANES Combined 2009-2012 *
Mild - Moderate Attachment Loss (3-5mm) & Any Dental Visit	72.0%	NHANES 2010-2011
Severe Attachment Loss (≥6mm) & Any Dental Visit	52.9%	NHANES 2010-2011
Diabetes & Periodonture Dental Visit	3.7%	MCBS 2011
Heart Disease & Periodonture Dental Visit	4.1%	MCBS 2011
Stroke & Periodonture Dental Visit	1.1%	MCBS 2011
Periodontal Dental Visit	2.9%	MEPS 2006

* Results as reported in Eke, Dye, Wei, et al.

Estimated Impact of Receiving Periodontal Treatment

Periodontal issues appear to be common, especially among the seniors most often covered by Medicare, and the chronic conditions we analyzed (diabetes, heart disease, and stroke) affect nearly half of the fee-for-service population. Substantial variations in the medical costs for these groups reflect significant differences in the utilization of care. Several recent claims-based retrospective studies have demonstrated substantially lower medical costs for individuals who receive treatment for periodontal disease, especially among individuals with chronic conditions.

Four recent studies have examined the link between periodontal treatment and medical costs. In each of these instances, insurers used medical and dental claims to examine the total cost of care for individuals with and without periodontal treatment.

Table 4 Summary of Recent Studies on Periodontal Treatment Cost Savings

	United Concordia / Highmark	Cigna	Aetna	UnitedHealth
Condition	Type 2 diabetes CAD CVD Rheumatoid arthritis Pregnancy	Diabetes Heart disease Stroke	Diabetes Cardiovascular disease Pregnancy	Diabetes Asthma CHF CAD COPD Chronic kidney / renal failure
Data Source	Claims data from 338,891 individuals with at least one of the five systemic conditions and evidence of periodontal disease	Claims data from 10,634 patients (5,317 each for the Study and Control groups)	Aetna's Dental Medical Integration Program	130,546 UnitedHealthcare commercial dental and medical members
Time Period	2005-2009	2009-2011	2010-2012	2008-2011
Medical Cost Reduction	Annual reduction with periodontal treatment (2006-2009): Diabetes: \$2,840 (40.2%) CAD: \$1,090 (10.7%) CVD: \$5,681 (40.9%) Rheumatoid arthritis: \$581 (6.3%)	Annual reduction with periodontal treatment in the final year: Diabetes: \$1,292 (27.6%) Heart disease: \$2,183 (25.4%) Stroke: \$2,831 (34.7%)	Reduced medical claim costs by an average of 17%	Annual reduction* with periodontal treatment in 2010 (split "not compliant" and "compliant" with disease management) Diabetes: \$3,239 / \$1,515 Asthma: \$963 / \$114 CHF: \$11,663 / \$12,892 CAD: \$5,743 / \$4,231 COPD: \$2,171 / \$2,879 Chronic kidney / renal failure: \$14,034 / \$8,095
Other Results	Hospital admission reduction: Diabetes: 39.4% CAD: 28.6% CVD: 21.2% Rheumatoid arthritis: 4.5%	Average annual medical cost savings for all individuals with or without a medical condition: \$1,020 Hospital admission rate reduction: 67% ER rate reduction: 54%	Improved diabetes control by 45% Used 42% less major and basic dental services Required 3.5% fewer hospital admissions year-over-year compared to a 5.4% increase for non- members	PMPY cost for periodontal treatment (all members with chronic conditions): \$696 (surgical \$940; non- surgical \$680)

CAD=Coronary artery disease; CVD=Cerebral vascular disease; CHF=Congestive heart failure, COPD=Chronic obstructive pulmonary disease, PMPY=per member per year.

* The medical cost reduction results from United Medical Dental Integration Study were calculated using the difference in the average per-member-per-year medical cost for the "periodontal treatment" group and the "non-applicable or no dental history" group.

We primarily relied on the results from these studies to develop the estimated differences in medical costs for individuals with at least one of the three chronic conditions. We started with the overall annual cost of care for each group developed using estimates of the entire population as described above. We then determined the costs associated with individuals who did and did not receive periodontal treatment during the year. Using the results from the studies, we assumed that medical costs for beneficiaries with diabetes would be 29.8 percent lower if they received periodontal treatment, medical costs for beneficiaries with heart disease would be 19.8 percent lower; and medical costs for beneficiaries with a history of stroke would be 37.8 percent lower.

Table 5: Estimated Medicare Spending in 2013 on Individuals with Chronic Condition and Periodontal Disease

Population	Receiving Periodontal Care *	Not Receiving Periodontal Care
Diabetes	\$ 12,049	\$ 18,228
Heart Disease	\$ 12,842	\$ 15,671
Stroke	\$ 12,109	\$ 19,467

* Does not include cost of periodontal care

Given the significant differences in spending that this calculation suggested, we also examined the MCBS to estimate average Medicare spending for individuals with one of the target conditions who received periodontal treatment at a dentist visit compared to individuals who did not receive periodontal treatment. While the overall spending numbers in the MCBS were slightly lower than the averages produced from the CMS Chronic Conditions Public Use File, the differences in Medicare costs between the two groups were similar. Since the MCBS represents a subset of the Medicare population, whereas the Chronic Conditions Public Use File represents the entire Medicare population, we opted to rely on the latter file for our Medicare spending estimates.

Estimated Cost of Providing Periodontal Treatment & Maintenance Services

In order to treat periodontal disease to improve oral and overall health, additional services must be performed that are not currently covered under Medicare fee-for-service benefits. We assume that an initial treatment procedure costs Medicare \$825 and ongoing maintenance required every six months thereafter costs \$250. These estimates were provided by Pacific Dental Services, and represent the average allowed rate from private insurers. Both of these amounts represent 2015 costs and are trended using the Part B cost trend assumption in future years. We assume that 2016 will be the first year in which initial treatment and maintenance services are a covered benefit, and that all beneficiaries previously receiving treatment not paid for by Medicare will continue to receive ongoing maintenance services paid for by Medicare.

Estimated Savings from Increased Periodontal Disease Treatment

We estimate that the proportion of those with periodontal disease seeking treatment will increase from the current 5 percent to approximately 20 percent over the next decade. This

pattern is based on the gradual increase in Medicare beneficiaries who have been receiving the annual wellness visit, modified by the low national rate of treatment for periodontal disease.

Table 6: Estimated Percentage of Beneficiaries with Periodontal Disease Seeking Treatment under New Medicare Benefit

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Percentage of population seeking periodontal treatment	5%	9%	11%	13%	14%	15%	16%	17%	18%	19%	20%

We also assume that those who receive treatment for periodontal disease incur lower overall medical costs equal to those for our baseline treated population. We estimate Medicare will realize half the estimated cost savings in the first year of treatment, and the full amount in subsequent years. For the purposes of our analysis, we assume that all beneficiaries who receive the initial treatment continue to seek ongoing maintenance treatment and receive the full associated cost savings in years subsequent to the treatment.

Results

We estimate that the cost of providing initial treatment and maintenance for periodontal disease as a Medicare Part B benefit for fee-for-service beneficiaries with diabetes, heart disease, or stroke for the period 2016 to 2025 will be \$7.2 billion. The savings resulting from reduced utilization, complications, and overall better wellbeing are estimated to be \$70.7 billion over the same period. We estimate the overall impact to the Medicare program across these years to be \$63.5 billion.

Table 7: Estimated Impact on Medicare Program Spending (\$ billions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
Periodontal Benefit	0.5	0.5	0.6	0.5	0.6	0.7	0.8	0.9	1.0	1.1	7.2
Medical Savings	(1.1)	(2.8)	(4.1)	(5.4)	(6.4)	(7.5)	(8.7)	(10.0)	(11.5)	(13.3)	(70.7)
Total Impact	(0.5)	(2.3)	(3.5)	(4.8)	(5.7)	(6.8)	(7.9)	(9.2)	(10.6)	(12.2)	(63.5)

While we consider the values chosen for the assumptions explicit and implicit to our model reasonable and appropriate for the purposes outlined, other assumption values and modeling methodologies could also meet this standard. Therefore, we performed sensitivity analyses to capture how differences in assumed values and future experience may affect the cost or savings realized by the Medicare program. We found our model is most sensitive to the estimated savings between patients receiving periodontal treatment versus those not receiving periodontal treatment.

Table 8: Estimated Impact on Medicare Program Spending Sensitivity Scenarios (\$ billions)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2016-2025
+100bp Medical Trend	(0.5)	(2.3)	(3.7)	(5.0)	(6.1)	(7.2)	(8.5)	(10.0)	(11.6)	(13.6)	(68.7)
-100bp Medical Trend	(0.5)	(2.2)	(3.4)	(4.6)	(5.4)	(6.3)	(7.3)	(8.4)	(9.6)	(10.9)	(58.7)
25% Less Medical Savings	(0.3)	(1.5)	(2.4)	(3.3)	(4.0)	(4.7)	(5.5)	(6.4)	(7.4)	(8.5)	(44.0)
25% More Medical Savings	(0.9)	(3.1)	(4.8)	(6.4)	(7.6)	(9.0)	(10.5)	(12.1)	(14.0)	(16.1)	(84.4)
25% Less Utilization	(0.4)	(1.7)	(2.7)	(3.6)	(4.3)	(5.1)	(5.9)	(6.8)	(7.9)	(9.1)	(47.5)
25% More Utilization	(0.7)	(2.9)	(4.4)	(6.0)	(7.2)	(8.5)	(9.9)	(11.5)	(13.2)	(15.3)	(79.7)

Limitations

Our analysis focuses on expanding Medicare coverage of periodontal disease to beneficiaries with specific chronic conditions, namely diabetes, heart disease, or stroke. While some evidence and literature exists on the link between periodontal disease and overall health along with associated savings for individuals without one of these three conditions, much of the research has focused on the population to which we limit the periodontal treatment benefit. Our results assume neither a cost nor a savings for the Medicare population without diabetes, heart disease, or stroke because there would be no change to the benefits offered to them under the proposed Medicare fee-for-service program.

Appendix: Data Sources

We used the following data sources to inform our assumptions and estimates:

- Eke, Paul I., Bruce A. Dye, Liang Wei, Gary D. Slade, Gina O. Thornton-Evans, Wenche S. Borgnakke, George W. Taylor, Roy C. Page, James D. Beck, and Robert J. Genco. "Update on Prevalence of Periodontitis in Adults in the United States: NHANES 2009 to 2012." *Journal of Periodontology*: 611-22
- "Chronic Conditions Public Use Files." Centers for Medicare & Medicaid Services. October 9, 2012.
- 2014 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds
- "March 2015 Medicare Baseline." Congressional Budget Office. March 9, 2015.
- MK Jeffcoat, RL Jeffcoat, and PA Gladowski. "Impact of periodontal therapy on general health: evidence from insurance data for five systemic conditions." *Am J Prev Med* 47, no. 2 (2014): 166-74
- "Improved health and lower medical costs: why good dental care is important." Cigna Health and Life Insurance Company, 2013.
- "Aetna's Dental Medical Integration Program may help lower costs and result in better health." Aetna Inc., 2013.
- "Medical dental integration study." United HealthCare Services, Inc., 2013.
- Periodontal treatment and maintenance cost estimate data provided by Pacific Dental Services on June 12, 2015.
- "National Health and Nutrition Examination Survey." Centers for Disease Control and Prevention. 2010-2011.
- "Medical Expenditure Panel Survey." Agency for Healthcare Research and Quality. 2006.
- "Medicare Current Beneficiary Survey." Centers for Medicare & Medicaid Services. 2011.