

# A Real-World Analysis Of Dental Utilization And Costs Among Type I And Type II Diabetics

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## Background

- Periodontal disease is more prevalent and more severe in diabetics than non-diabetics. Periodontitis has been referred to as the “sixth complication of diabetes”<sup>1</sup>
- Several studies have analyzed dental outcomes comparing diabetics to healthy controls.<sup>2-7</sup> However, sample sizes have been small and/or reported outcomes have been limited.

## Objective

- To compare dental utilization and costs of diabetics (overall and separately for type I and type II diabetics) to matched controls using linked dental and medical claims in the United States.

## Methods

### Study Design and Patients

- Adults (aged ≥18 years) with an eligible diagnosis of diabetes mellitus (≥1 inpatient diagnosis in the primary position or ≥2 diagnoses on different days) in 2019 were extracted from the MarketScan<sup>®</sup> Dental, Commercial, and Medicare Databases.
  - Diabetics were classified with Type I or Type II disease based on all claims observed during 2019 (conflicts were assigned with unknown type).
- Diabetics were matched directly to non-diabetic controls (ratio 1:2) on age and sex.
- All patients were required to have continuous medical, pharmacy, and dental benefits and ≥1 dental service during 2019.

### Assessments

- The number of patients with specific dental procedures (e.g., fillings, crowns, etc.) or categories of dental services (e.g., preventative, restorative, endodontics) and costs (overall and by category) were reported during 2019 and compared between diabetics and matched controls.
- Results were reported overall and separately for Type I and Type II diabetics.

### Statistical Analyses

- Chi-square tests and t-tests were used to evaluate statistical significance for differences in categorical and continuous variables, respectively.

## Results

### Patients

- The analysis included 151,825 diabetics and 303,650 matched controls (Table 1).
  - For subgroup analyses, 10,157 (6.7%) and 139,775 (92.1%) diabetics were identified as having Type I and Type II disease, respectively; 1,893 (1.3%) diabetics had unknown status and were not included in either subgroup.
  - Overall, the mean age was 58.0 years. Type I diabetics were younger (45.9 years) than Type II diabetics (58.9 years).

### Dental Utilization

- Diabetics were less likely to have preventative visits (75.1% vs. 81.9%;  $P<0.001$ ) (Table 2) and more likely to have at least one non-routine service (53.5% vs. 47.6%,  $P<0.001$ ) compared with controls (Figure 1).
  - The same trends held for both Type I and Type II diabetics (all  $P<0.001$ ), with Type II diabetics having more substantial differences relative to their controls (relative differences for Type I vs. Type II: preventative visits, 1.9% lower vs. 7.1% lower; non-routine services, 4.9% higher vs. 5.9% higher).
- Diabetics had a significantly higher chance of having fillings (28.4% vs. 26.2%), crowns (18.6% vs. 17.9%), root canals (5.9% vs. 4.7%), dentures (3.7% vs. 2.0%), and tooth extraction (11.7% vs. 7.7%) compared with controls (all  $P<0.001$ ) (Figure 2).
  - While both Type I and Type II diabetics had significantly higher chance of having each of these dental procedures (all  $P<0.01$ ), Type I diabetics had greater differences for fillings and crowns while Type II diabetics had greater differences for dentures and tooth extraction relative to their respective controls (relative differences for Type I vs. Type II: fillings, 3.7% higher vs. 2.0% higher; crowns, 1.1% higher vs. 0.6% higher; dentures, 0.9% higher vs. 1.7% higher; tooth extraction, 1.5% higher vs. 4.1% higher).
- Diabetics had a significantly lower chance of having implant (2.8% vs. 3.0%,  $P<0.001$ ) and orthodontic services (0.5% vs. 0.7%,  $P<0.001$ ) compared with controls (Table 2).
  - Both Type I and Type II diabetics had a significantly lower chance of having orthodontic services (Type I diabetics: 0.9% vs. 1.3%, Type II diabetics: 0.4% vs. 0.7%; both  $P<0.01$ ) but only Type II diabetics had significantly lower chance of having implant services (Type I diabetics: 2.2% vs. 2.2%,  $P=0.978$ ; Type II diabetics: 2.9% vs. 3.1%,  $P<0.001$ ).

Table 1. Demographic and Clinical Characteristics Among Diabetics and Controls

	Overall Cohort		Type I Diabetes		Type II Diabetes	
	Diabetics (n=151,825)	Controls (n=303,650)	Type I Diabetics (n=10,157)	Controls (n=20,314)	Type II Diabetics (n=139,775)	Controls (n=279,550)
Age* in years, mean (SD)	58.0 (12.5)	58.0 (12.5)	45.9 (16.1)	45.9 (16.1)	58.9 (11.6)	58.9 (11.6)
Age category*, N (%)						
18-34	5,696 (3.8%)	11,392 (3.8%)	2,738 (27.0%)	5,476 (27.0%)	2,781 (2.0%)	5,562 (2.0%)
35-44	12,663 (8.3%)	25,326 (8.3%)	1,649 (16.2%)	3,298 (16.2%)	10,829 (7.7%)	21,658 (7.7%)
45-54	35,155 (23.2%)	70,310 (23.2%)	2,329 (22.9%)	4,658 (22.9%)	32,385 (23.2%)	64,770 (23.2%)
55-64	61,892 (40.8%)	123,784 (40.8%)	2,463 (24.2%)	4,926 (24.2%)	58,749 (42.0%)	117,498 (42.0%)
65+	36,419 (24.0%)	72,838 (24.0%)	978 (9.6%)	1,956 (9.6%)	35,031 (25.1%)	70,062 (25.1%)
Male*, N (%)	81,091 (53.4%)	162,182 (53.4%)	5,195 (51.1%)	10,390 (51.1%)	74,850 (53.6%)	149,700 (53.6%)
CCI**, mean (SD)	2.3 (1.8)	0.5 (1.1)	2.1 (1.5)	0.3 (0.9)	2.3 (1.8)	0.5 (1.1)
Adapted DCSI**, mean (SD)	1.1 (1.6)		1.3 (1.6)		1.1 (1.5)	

CCI, Charlson comorbidity index; DCSI, diabetes complication severity index; SD, standard deviation.  
\* Measured on January 1, 2019  
\*\* Measured during 2019

Table 2. Frequency of Dental Services for Diabetics and Controls in 2019, by Services Category

	Overall Cohort			Type I Diabetes			Type II Diabetes		
	Diabetics (n=151,825)	Controls (n=303,650)	P	Type I Diabetics (n=10,157)	Controls (n=20,314)	P	Type II Diabetics (n=139,775)	Controls (n=279,550)	P
Diagnostic	145,242 (95.7%)	292,161 (96.2%)	<0.001	9,752 (96.0%)	19,549 (96.2%)	0.343	133,701 (95.7%)	268,974 (96.2%)	<0.001
Preventative	114,073 (75.1%)	248,630 (81.9%)	<0.001	8,306 (81.8%)	17,003 (83.7%)	<0.001	104,345 (74.7%)	228,499 (81.7%)	<0.001
Restorative	63,203 (41.6%)	118,461 (39.0%)	<0.001	4,068 (40.1%)	7,222 (35.6%)	<0.001	58,358 (41.8%)	109,793 (39.3%)	<0.001
Endodontics	10,411 (6.9%)	17,093 (5.6%)	<0.001	627 (6.2%)	1,029 (5.1%)	<0.001	9,666 (6.9%)	15,868 (5.7%)	<0.001
Periodontics	30,383 (20.0%)	50,854 (16.8%)	<0.001	1,474 (14.5%)	2,862 (14.1%)	0.319	28,553 (20.4%)	47,374 (17.0%)	<0.001
Removable Prosthodontics	5,598 (3.7%)	6,232 (2.1%)	<0.001	196 (1.9%)	217 (1.1%)	<0.001	5,345 (3.8%)	5,945 (2.1%)	<0.001
Fixed Prosthodontics	2,392 (1.6%)	3,790 (1.3%)	<0.001	95 (0.9%)	176 (0.9%)	0.546	2,270 (1.6%)	3,572 (1.3%)	<0.001
Maxillofacial Prosthetics	39 (0.0%)	114 (0.0%)	0.040	1 (0.0%)	6 (0.0%)	0.437	36 (0.0%)	106 (0.0%)	0.044
Implants	4,287 (2.8%)	9,169 (3.0%)	<0.001	223 (2.2%)	445 (2.2%)	0.978	4,013 (2.9%)	8,603 (3.1%)	<0.001
Oral and Maxillofacial Surgery	18,474 (12.2%)	24,879 (8.2%)	<0.001	957 (9.4%)	1,614 (8.0%)	<0.001	17,303 (12.4%)	22,964 (8.2%)	<0.001
Orthodontics	682 (0.5%)	2,171 (0.7%)	<0.001	92 (0.9%)	254 (1.3%)	0.007	583 (0.4%)	1,878 (0.7%)	<0.001
Adjunctive General Services	11,991 (7.9%)	22,063 (7.3%)	<0.001	886 (8.7%)	1,640 (8.1%)	0.052	10,943 (7.8%)	20,134 (7.2%)	<0.001

Figure 1. Non-Routine Care Among Diabetics and Controls in 2019

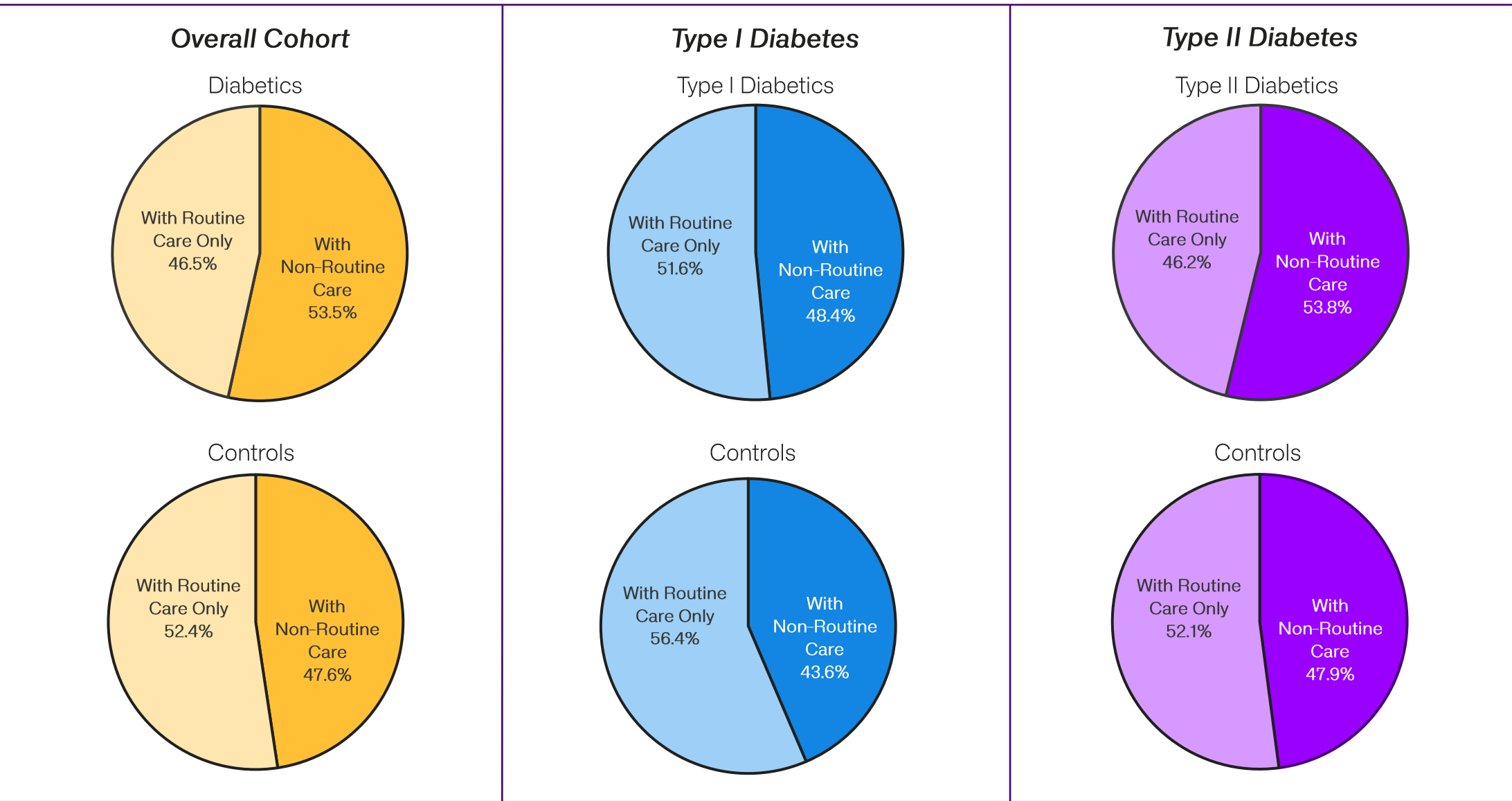
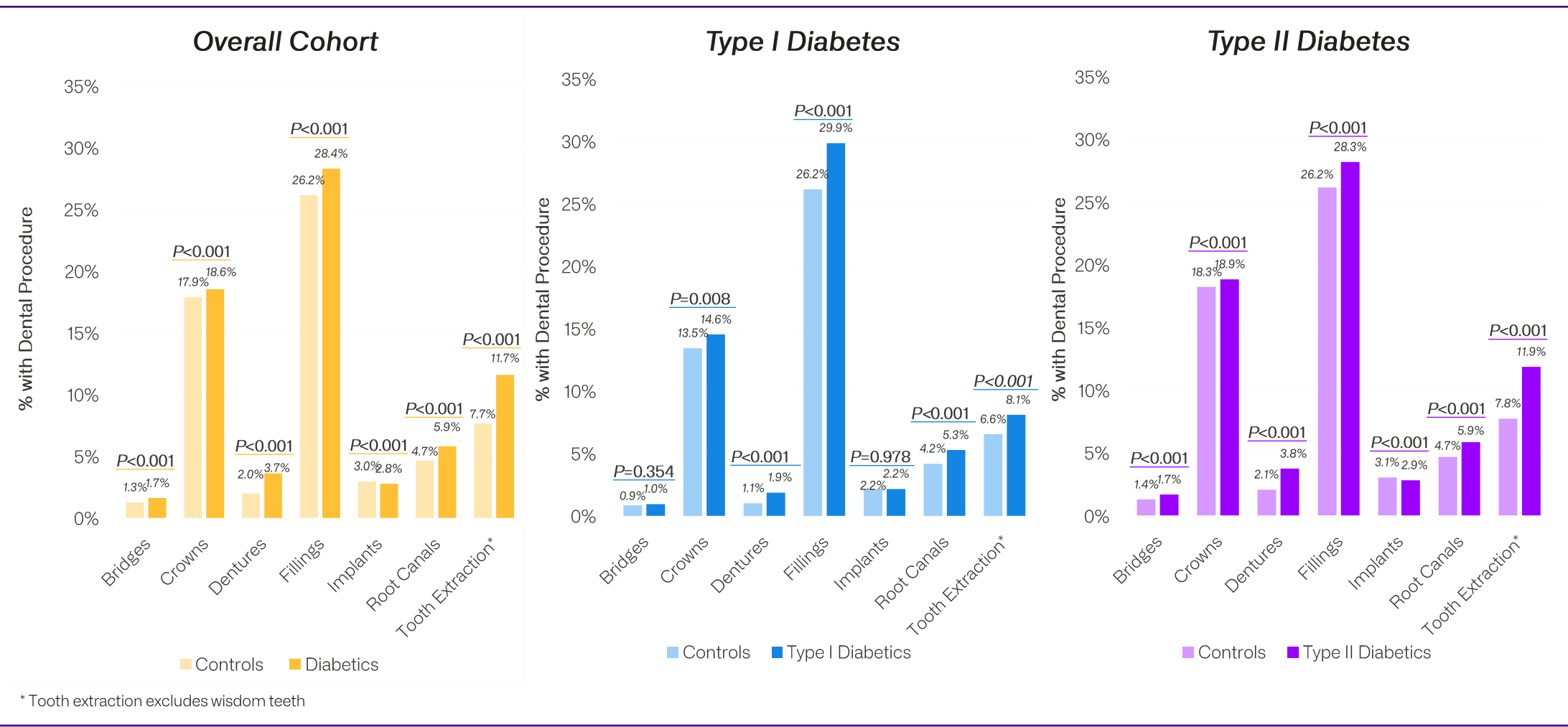


Figure 2. Frequency of Dental Procedures Among Diabetics and Controls in 2019

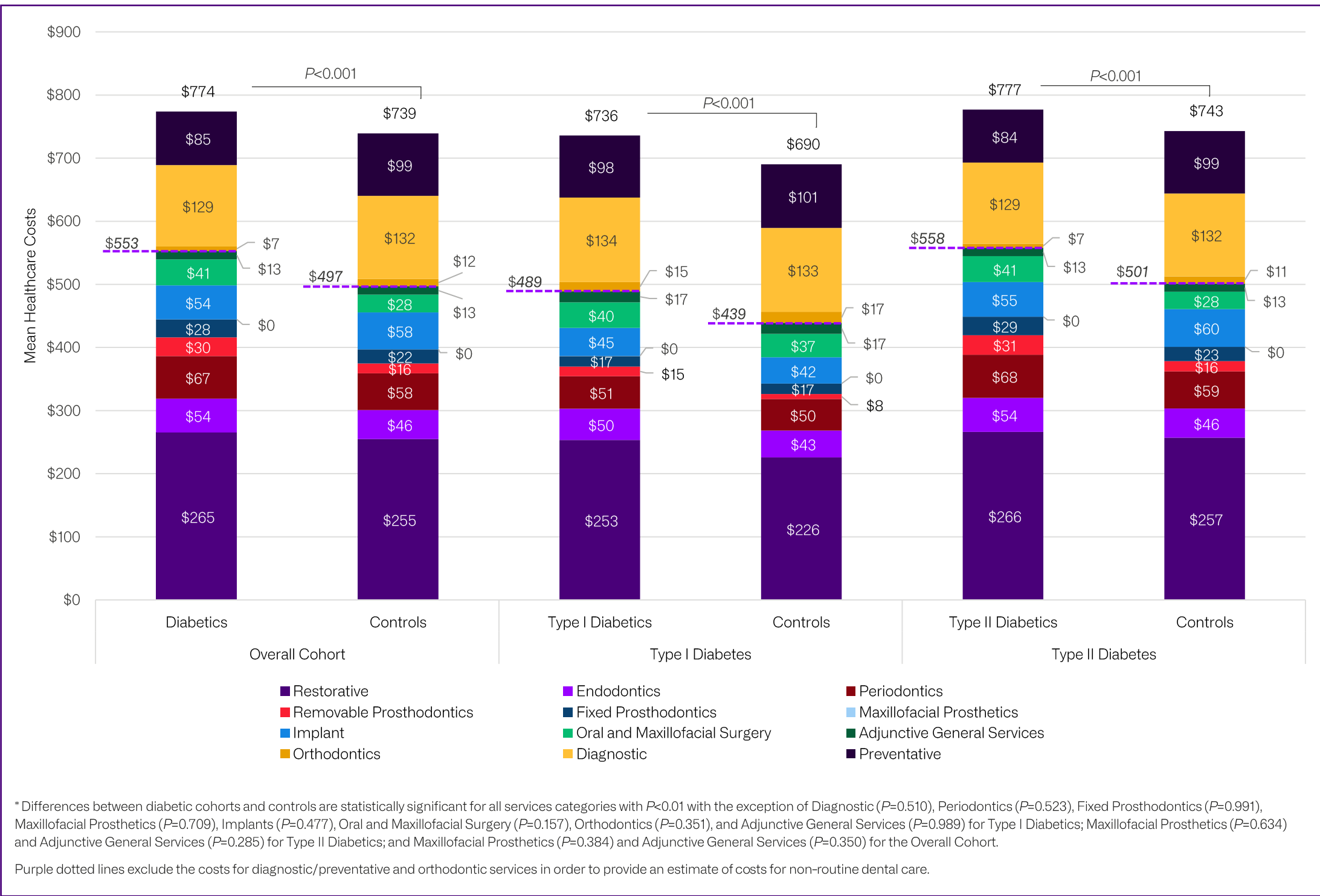


## Results (cont.)

### Dental Costs

- Diabetics had significantly higher average dental costs overall (\$774 vs. \$739;  $P<0.001$ ) and in most categories of dental services (restorative: \$265 vs. \$255; periodontics: \$67 vs. \$58; endodontics: \$54 vs. \$46, prosthodontics [fixed and removable]: \$58 vs. \$38; oral surgery: \$41 vs. \$28; all  $P<0.001$ ) compared with controls (Figure 3).
  - While Type II diabetics had significantly higher costs ( $P<0.001$ ) in each of these categories, Type I diabetics did not show significant differences in costs for periodontics or oral surgery.
- After removing the costs associated with diagnostic/preventative care (which are mostly routine services) and orthodontic services (which are not performed by a dentist), diabetics have \$56 higher costs for dental services compared with controls (\$553 vs. \$497) (Figure 3).
  - The analogous costs for Type I diabetics were \$50 higher (\$489 vs. \$439) and Type II diabetics were \$57 higher (\$558 vs. \$501) than their respective controls.

Figure 3. Healthcare Costs Measured Over 12 Months of Follow-up\*



## Conclusions

- This real-world analysis found that diabetics have less preventative dental visits, more non-routine dental services, and higher dental costs than matched controls.
  - These trends apply to both Type I and Type II diabetics but are more pronounced for Type II diabetics.
- Lower rates of preventative dental care may contribute to poorer dental outcomes and higher dental costs among diabetics. This relationship should be explored.

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### Disclosure

MJ and NP are employees of Merative.