



Healthcare costs associated with type 1 diabetes in adults with a Commercial, Medicaid, or Medicare coverage in US clinical practice

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INTRODUCTION

- Approximately 1.7 million adults in the US live with type 1 diabetes (T1D).¹
- Advances in treatment have increased the life expectancy and improved quality of life of patients living with T1D.²
- However, T1D remains an illness that is shortening life expectancy and is associated with a substantial clinical burden, including a high prevalence of neuropathy, nephropathy, retinopathy, and cardiovascular complications.³
- T1D incurred an estimated economic burden of >\$30 billion in the US in 2019.⁴

OBJECTIVE

- In this study, we estimated healthcare costs among adult patients with T1D in routine clinical practice in the US and compared patients enrolled in Commercial, Medicaid, and Medicare health plans.

METHODS

- This retrospective cohort study analyzed Merative MarketScan[®] data (Commercial, Medicaid, and Medicare Supplemental insurance databases) from January 1, 2014, to June 30, 2019, for adults (≥18 years) with a T1D diagnosis.
 - A T1D diagnosis was defined as patients with ≥2 medical claims (inpatient or outpatient) with a primary or secondary code for T1D (*International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]* codes 250.X1, 250.X3 and *Tenth Revision [ICD-10-CM]* codes E10.X) ≥30 days apart and **either** a ratio of T1D to type 2 diabetes (T2D) diagnosis codes >0.5 with a prescription for glucagon or no record for oral hypoglycemics (except metformin) **or** a urine acetone test prescription between January 1, 2014, and December 31, 2016.
- The index date was January 1, 2017, and follow-up length was variable until either health plan disenrollment or the last day of available data, whichever occurred first.
- Patients were required to have continuous health plan enrollment for ≥12 months prior to the index date and ≥1 month of follow-up data.

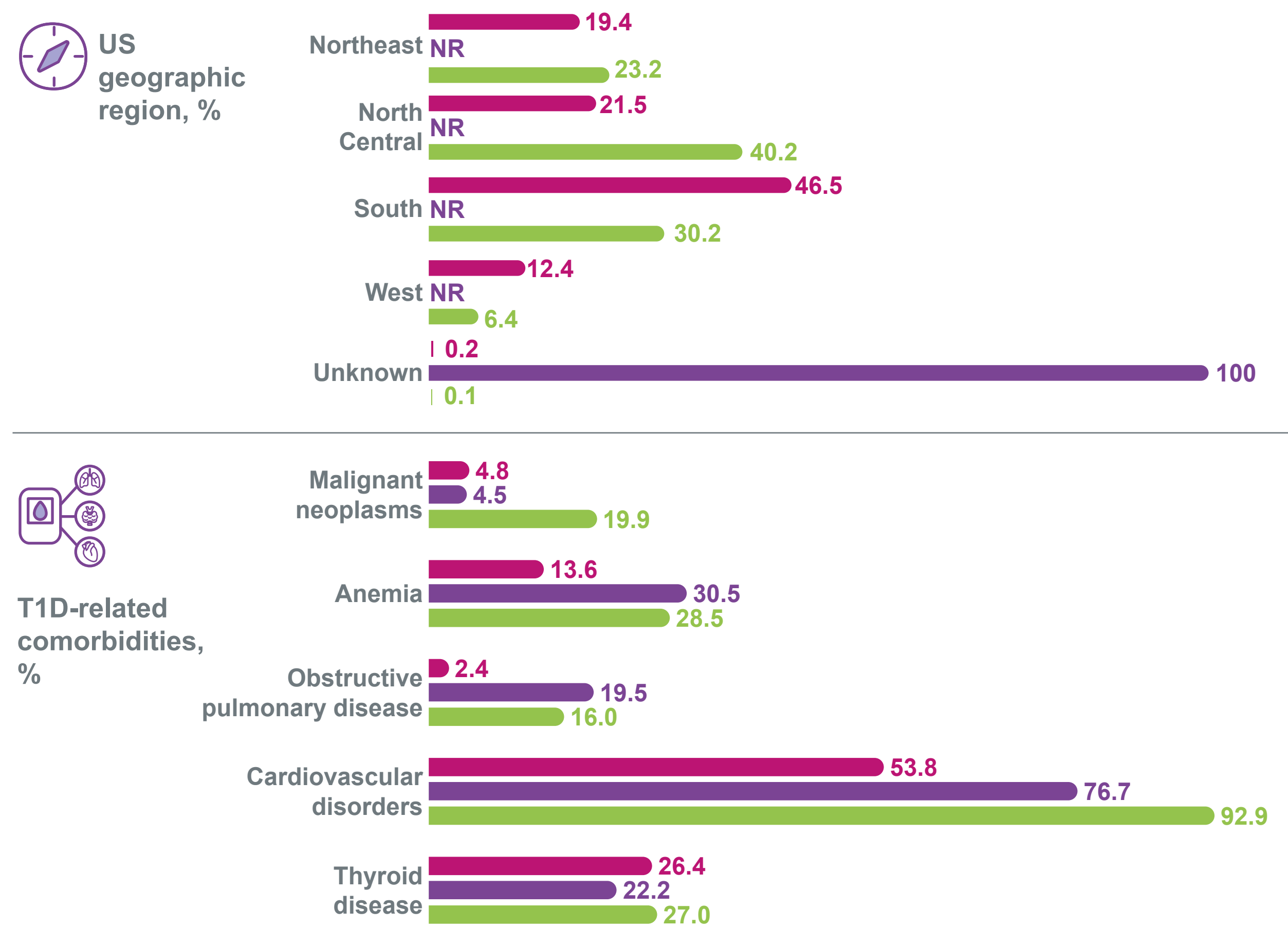
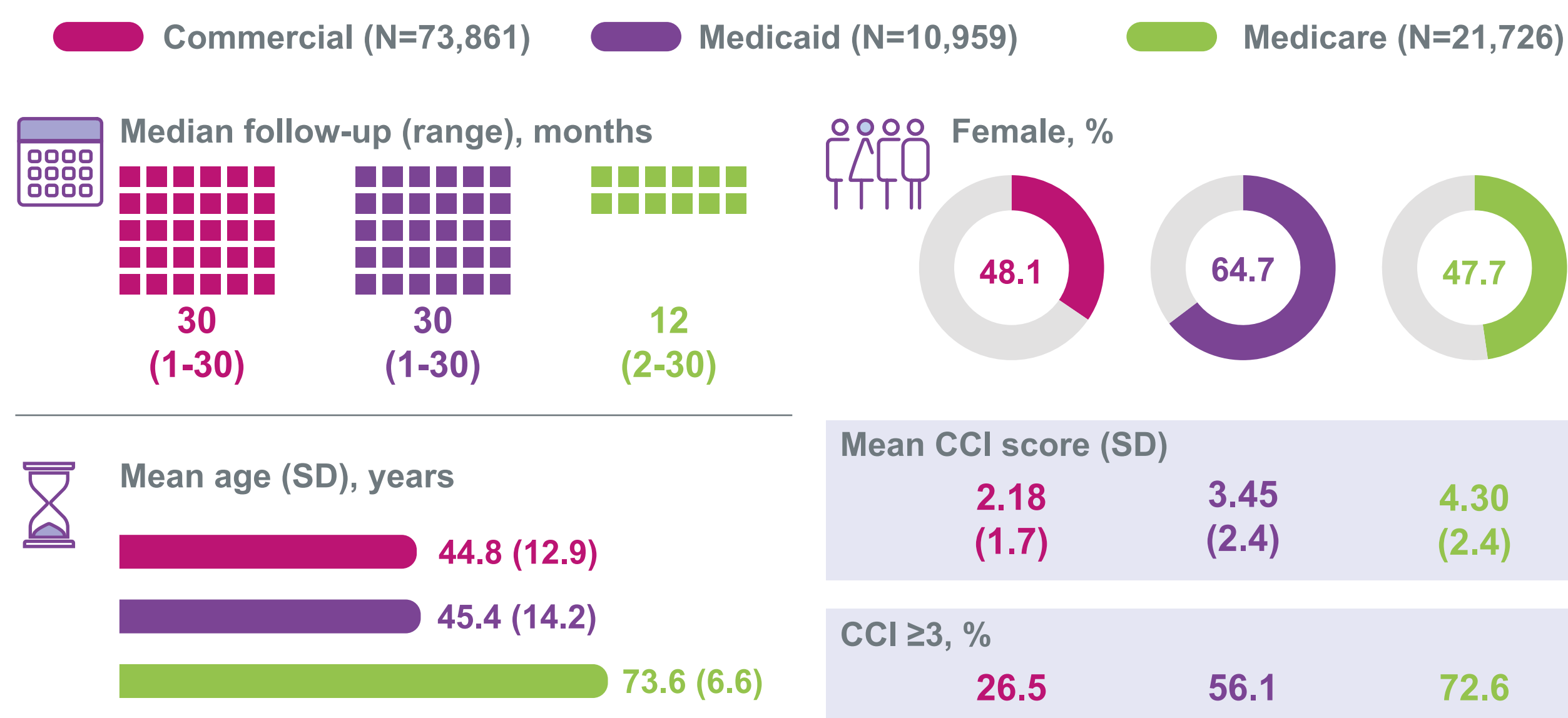
- Overall and annualized T1D-related and all-cause costs during follow-up were reported by the health plan.
 - All costs were adjusted for inflation to 2019 US dollars using the medical care services component of the Consumer Price Index.
 - Costs include all insurer and health plan payments plus patient cost-sharing including copayments, deductibles, and coinsurance.

RESULTS

- Included were:
 - Commercial health plans: 73,861 patients; mean age (SD) 44.8 (12.9) years; 48.1% female
 - Medicaid: 10,959 patients; mean age (SD) 45.4 (14.2) years; 64.7% female
 - Medicare: 21,726 patients; mean age (SD) 73.6 (6.6) years; 47.7% female (**Figure 1**).
- The median (range) follow-up was 30 (1-30) months, 30 (1-30) months, and 12 (1-30) months, respectively.
- Mean total T1D-related healthcare costs were nearly twice as high for patients enrolled in Medicaid (\$57,679) vs patients with Medicare (\$33,787) or a Commercial health plan (\$32,787); similarly, all-cause healthcare costs for Medicaid enrollees were 1.3 and 1.7 times higher relative to patients enrolled in Medicare or a Commercial health plan, respectively (**Table 2**).

- Annualized T1D-related costs were highest for patients enrolled in Medicaid (\$29,706), followed by patients enrolled in Medicare (\$23,036) and in a Commercial health plan (\$17,487); all-cause costs were similar between patients enrolled in Medicare (\$51,368) and Medicaid (\$48,591) but lower for patients with a Commercial health plan (\$29,105).

Figure 1. Baseline characteristics



CCI, Charlson Comorbidity Index; NR, not reported; T1D, type 1 diabetes.

Table 1. T1D-related healthcare costs per adult patient with diagnosed T1D

	Commercial (N=73,861)		Medicaid (N=10,959)		Medicare (N=21,726)	
	T1D related	All cause	T1D related	All cause	T1D related	All cause
Annualized total costs (SD), \$US	17,487	29,105	29,706	48,591	23,036	51,368
Total costs during follow-up (SD), \$US	32,787 (71,157)	54,572 (120,357)	57,679 (150,116)	94,348 (174,459)	33,787 (86,039)	75,340 (182,135)
Insulin	8,708 (9,017)	NA	7,859 (9,656)	NA	5,395 (7,296)	NA
Metformin	250 (2,034)	NA	201 (2,174)	NA	265 (2,264)	NA
Other medication ^a	1,480 (4,196)	NA	1,197 (3,564)	NA	1,568 (3,897)	NA
Equipment ^b	4,596 (6,486)	NA	1,547 (2,625)	NA	1,187 (5,379)	NA
Diabetic ketoacidosis	700 (8,426)	NA	3,487 (35,425)	NA	155 (3,503)	NA
Hypoglycemic events	177 (3,852)	NA	469 (5,739)	NA	265 (3,997)	NA
Inpatient care	10,553 (58,874) ^c	12,990 (66,849)	33,968 (134,831) ^c	42,340 (152,584)	17,311 (73,987) ^c	22,600 (85,696)
Outpatient care	5,031 (22,890) ^c	18,124 (72,441)	5,552 (13,042) ^c	23,367 (40,575)	6,685 (27,537) ^c	34,210 (132,822)
Emergency room	1,292 (6,522) ^c	2,383 (10,238)	3,398 (8,794) ^c	6,189 (13,722)	956 (4,285) ^c	3,125 (9,967)
Pharmacy	NA	21,075 (29,129)	NA	22,452 (36,824)	NA	15,404 (23,345)

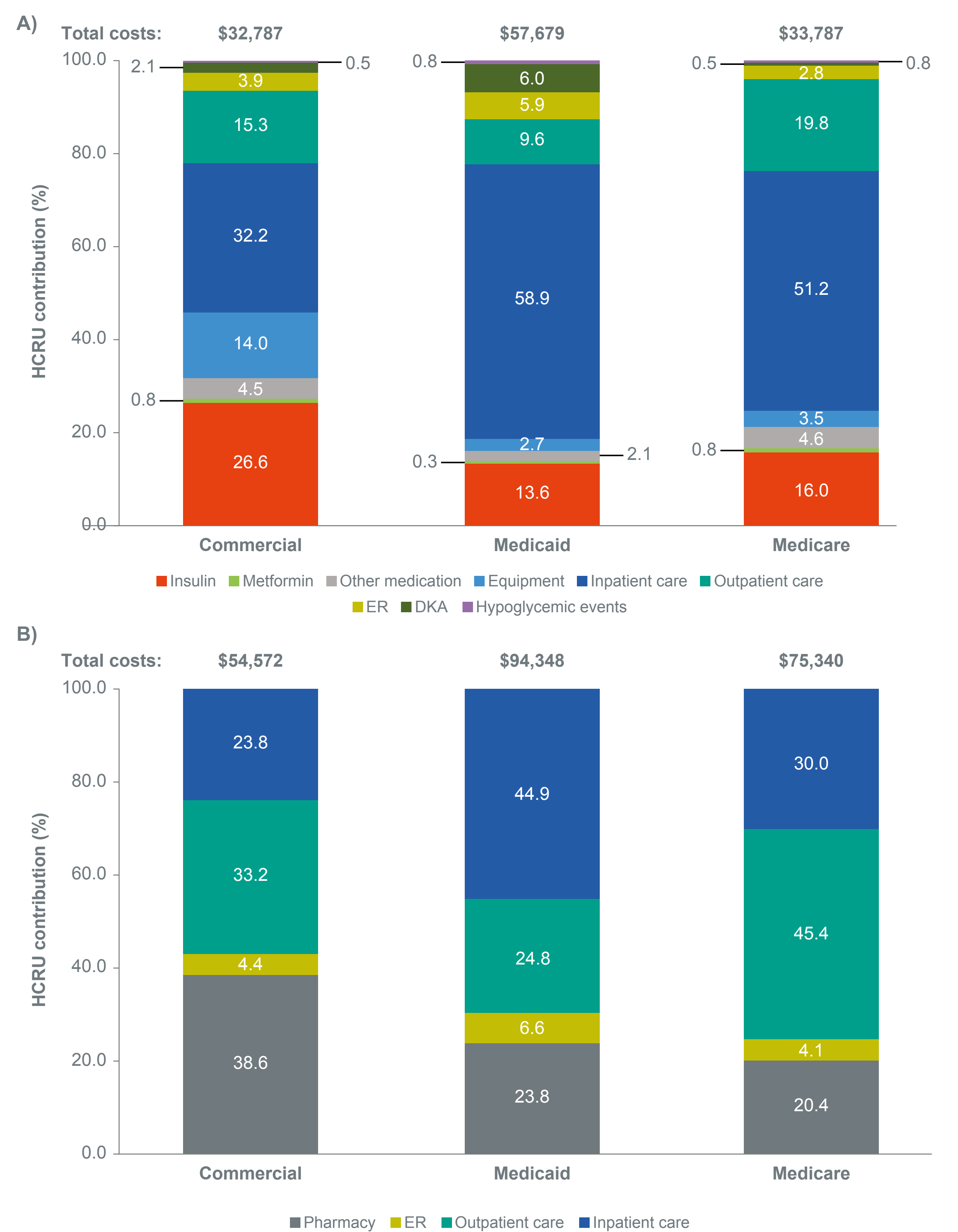
^aIncludes glucagon, dipeptidyl peptidase inhibitors, and oral hypoglycemic agents (other than metformin).

^bIncludes insulin pumps, continuous glucose monitors, insulin delivery devices (syringes/needles/pens), glucose test strips, and other monitoring devices.

^cIncludes claims with diagnosis for T1D (any position).

NA, not applicable; T1D, type 1 diabetes.

Figure 2. Contribution of each HCRU category to total T1D-related costs: (A) T1D-related costs; (B) All-cause costs



DKA, diabetic ketoacidosis; ER, emergency room; HCRU, healthcare resource utilization; T1D, type 1 diabetes.

- Throughout follow-up, inpatient care was the primary T1D-related cost driver in all health plans, comprising 32% (Commercial), 59% (Medicaid), and 51% (Medicare) of total T1D-related healthcare costs (**Figure 2**).
- However, inpatient costs accounted for a smaller proportion of all-cause total healthcare costs (Commercial: 24%; Medicaid: 45%; and Medicare: 30%).
- Insulin and diabetes-related equipment (including glucose monitoring and insulin pumps) accounted for more T1D-related costs in patients with a Commercial health plan (27% and 14%, respectively) than in patients with a Medicare (16% and 4%, respectively) or Medicaid health plan (14% and 3%, respectively) (**Figure 2**).
- Outpatient care contributed substantially to T1D-related costs of Medicare enrollees (20%), followed by Commercial enrollees (15%) and Medicaid enrollees (10%) (**Figure 2**).
- Outpatient costs accounted for a greater proportion of all-cause total healthcare costs (Commercial: 33%; Medicaid: 25%; Medicare: 45%).
- Emergency room (ER) visits and diabetic ketoacidosis events contributed to T1D-related costs more in patients with Medicaid (6% and 6%) than in patients with a Commercial (4% and 2%) or a Medicare (3% and <1%) health plan.

CONCLUSIONS

- Medicaid enrollees generally incurred higher costs than Medicare or Commercial enrollees.
- Inpatient care, ER visits, and diabetic ketoacidosis events accounted for a relatively greater proportion of total costs for patients with Medicaid plans than for patients with Medicare or Commercial plans; insulin and diabetes-related equipment use appeared to be substantially higher for Commercial enrollees.
- It should be noted that data were limited to fee-for-service in Medicaid enrollees, and patients enrolled in Medicaid with dual eligibility with Medicare were excluded.
 - Additionally, some information on out-of-pocket costs may be missing from the database, which potentially underestimated total costs.
- A common limitation of claims analyses is the potential inaccuracy of codes; however, the case definition for T1D used in this analysis is based on an optimized, validated algorithm, which can distinguish T1D from T2D using claims/electronic medical record data and has shown to be highly sensitive (sensitivity 100%) in identifying T1D cases and has a high predictive value (90%).⁵
- Overall, these observations indicate substantial disparities in healthcare costs between health plans; these differences may suggest that patients enrolled in Medicare and Medicaid are less likely to receive or fulfill the requirements for a prescription for glucose monitors and insulin pumps compared with patients enrolled in Commercial health plans, leading to additional costs related to inpatient care, hospitalizations, and diabetic ketoacidosis events.

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DISCLOSURES

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