RWD73

Economic Burden of Type 1 Diabetes Mellitus After Disease Onset: A Claims Data Analysis

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BACKGROUND

- Type 1 diabetes mellitus (T1DM): Autoimmune disorder manifesting in childhood and adulthood; not lifestyle-driven.
- Burden on patients: Reduced quality of life, comorbidities, complications (e.g., ketoacidosis and hypoglycemia).
- Burden on healthcare system: High demand for inpatient care, cost-intensive diabetes technologies (insulin pumps, continuous glucose monitoring (CGM) systems), long-term medication.
- Rationale for study: Provide up-to-date, real-world evidence from Germany to support healthcare planning and evaluation of preventive interventions.

MATERIALS AND METHODS

- **Study design and data:** Retrospective cohort (2017–2023) using anonymized Barmer statutory health insurance (SHI) claims (~9M insured)
- **Case identification:** Incident T1DM: ICD-10-GM codes (E10.-) + ATC-coded prescriptions (insulins)
- **Controls:** 1:10 matched on age, sex, index quarter, region, and Rx-Risk Score
- **Outcomes:**
  - Epidemiology: incidence of T1DM, complications (e.g., ketoacidosis)
  - Healthcare resource utilization (HCRU): physician contacts, hospitalizations, prescriptions
  - Costs: direct medical costs (total and components: drugs, medical aids, inpatient/outpatient care)
- **Analysis strategy:**
  - Stratified by age groups (with focus on pediatric populations)
  - Onset phase (0–12 mo) vs. steady-state (13–36 mo)
  - Excess costs estimated with spline-based Generalized Additive Models (GAMs), adjusted for age, sex, index year, comorbidities, Rx-Risk

RESULTS

T1DM incidence and study population

- Incidence: Annual cumulative incidence of T1DM increased from 9.20/100,000 (2018) to 11.46/100,000 (2022). Higher incidence in children and adolescents compared to adults.
- Study population: 2,047 incident T1DM patients vs. 20,267 matched controls. Broad age distribution, with pediatric cases representing a large share.

Overall costs and temporal pattern

- Mean healthcare costs consistently higher in T1DM vs. controls.
- **Excess costs highest in onset phase: €12,406.31** (mainly hospitalizations). Costs decreased in steady-state: Year 1: €6,402 / Year 2: €5,879 (Table 1).
- Cost drivers shifted over time → from inpatient care (onset) to medical aids and prescription drugs (steady-state).

Table 1: Total healthcare costs: T1DM group vs. control group at onset and during steady state

	T1DM Group (N=2,047)		Control Group (N=20,267)		T1DM Excess Costs
	mean	SD	mean	SD	Δ
Onset costs	€13,941.69	€17,067.29	€1,535.38	€7,328.49	**€12,406.31**
Steady state costs (year 1)	€8,002.98	€17,309.62	€1,601.04	€7,307.41	**€6,401.94**
Steady state costs (year 2)	€7,625.02	€13,760.42	€1,746.15	€8,111.05	**€5,878.87**

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Abbreviations: CGM: continuous glucose monitoring; GAM: Generalized Additive Model; HCRU: healthcare resource utilization, ICD: International Classification of Diseases, SD: standard deviation; SHI: statutory health insurance; T1DM: Type 1 Diabetes Mellitus.

The results were presented at the German Congress for Pediatrics and Adolescent Medicine (KKJ) 2025 on September 25, 2025.

Age-stratified analyses

- Excess costs most pronounced in children and older adults at onset (Figure 1):
  - **0–7 yrs:** €19,186 (mainly inpatient + medical aids)
  - **65–79 yrs:** €21,570 (mainly inpatient + prescription drugs)
- Pediatric costs dominated by diabetes technologies (insulin pumps, CGM systems) and hospitalization.
- Adult costs increasingly driven by prescription drugs and hospitalization.

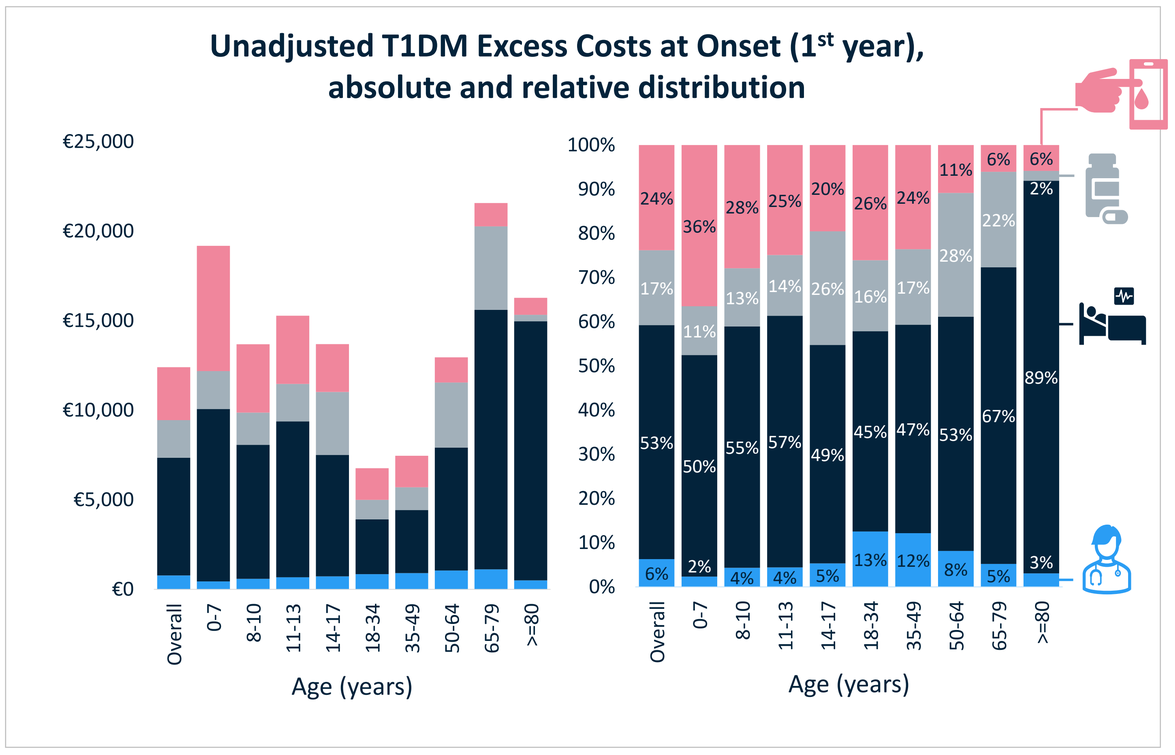

Figure 1: Unadjusted T1DM excess costs at onset by age group

Adjusted T1DM cost trajectories

- Unadjusted data showed high variability in costs → partly explainable by confounders (cystic fibrosis, pancreatic cancer, other pancreatic diseases).
- GAMs adjusted for age, sex, index year, comorbidities, Rx-Risk (Figure 2) revealed:
  - T1DM group: Costs peak in childhood, decline in early/mid-adulthood, and increase in older age.
  - Control group: Costs steadily increased with age but remained substantially lower across all groups.

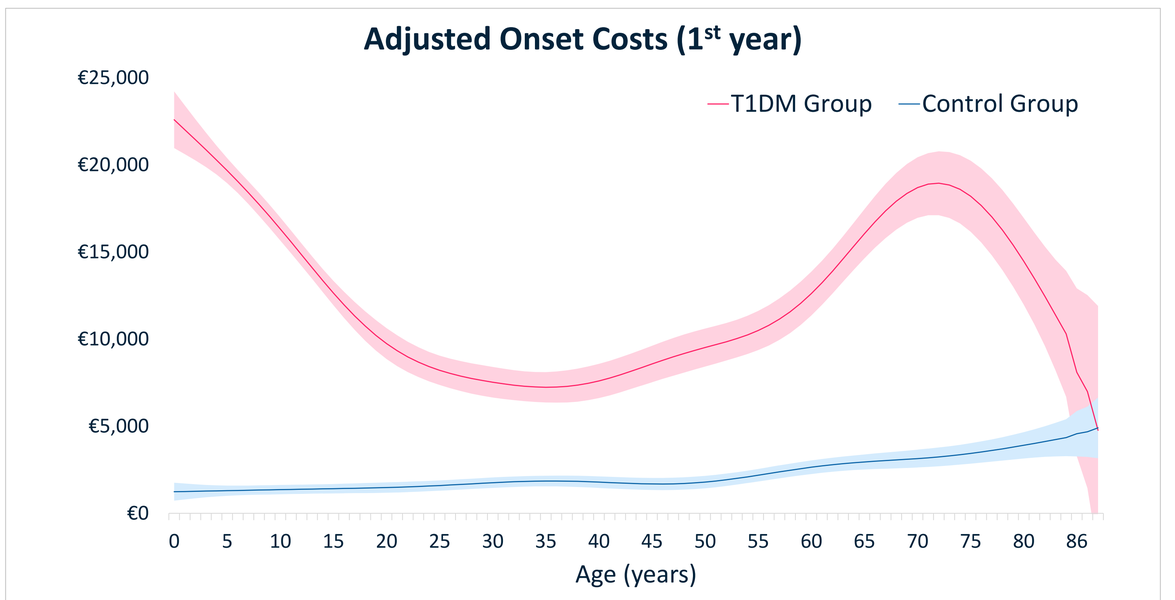

Figure 2: Total healthcare costs: T1DM vs. control group at onset, graphical representation of smoothing terms from spline-based GAMs

CONCLUSION

- Excess costs peak at disease onset, mainly due to hospitalizations and medical aids.
- Children and adolescents account for the highest economic burden, driven by insulin pumps and CGM systems.
- Age-specific pattern: Highest costs in childhood, decline in adulthood, rise again in older age.
- Interventions delaying T1DM onset may therefore reduce the economic burden, especially in younger populations.