Burden of Type 1 Diabetes
Incidence and Prevalence of Type 1 Diabetes

- T1D is the major type of diabetes in youth
  - Accounts for ≥85% of all diabetes cases in patients <20 years of age
- Incidence is increasing by 2% to 5% worldwide
- U.S. prevalence is approximately 1 in 300

T1D, type 1 diabetes.

Diabetes in Children and Young Adults

- In the past, diabetes in youth was almost always T1D, but more T2D is no longer “adult onset” diabetes only
- Nearly all children with diabetes diagnosed <10 years have T1D
  - Majority of non-Hispanic youth with diabetes diagnosed have T1D
- However, among US children 10-19 years at diagnosis
  - Half of African-American and Hispanic patients have T2D
  - More than half of Asian/Pacific Islanders and American Indians have T2D

T1D, type 1 diabetes; T2D, type 2 diabetes.
Incidence of Diabetes in Youth, 2003-2012

SEARCH for Diabetes in Youth
Youth Age ≤19 Years, 2012

Ages 10-19 years, cases per 100,000 youths/year

T1D, type 1 diabetes; T2D, type 2 diabetes.

T1D Age at Diagnosis Among Youth

SEARCH for Diabetes in Youth
Youth Age ≤19 Years, 2012

Cases per 100,000 youths/year

Individuals ≥20 years of age may also develop T1D.

Annual Incidence of Diabetes in US Children and Adolescents

SEARCH for Diabetes in Youth
Youth Age ≤19 Years, 2012

T1D, Ages 0-19 years

T2D, Ages 10-19 years

Rate (per 100,000 per year)

API, Asians/Pacific Islanders; H, Hispanics; NA, Native American; NHB, non-Hispanic blacks; NHW, non-Hispanic whites; T1D, type 1 diabetes; T2D, type 2 diabetes.

Immunological Changes and Incidence of Type 1 Diabetes

- Rising incidence of T1D is associated with altered immunophenotype at diagnosis
- Prevalence of IA-2A and ZnT8A has increased significantly
- IAA and GADA prevalence and levels have not changed
- Suggests T1D is now characterized by a more intense humoral autoimmune response

IAA, autoantibodies to insulin; GADA, GAD; IA-2A, islet antigen-2; T1D, type 1 diabetes; ZnT8A, zinc transporter 8.

Postulated Contributing Factors for T1D Risk

- Infections*
- Early childhood diet (dietary proteins)*
- Vitamin D exposure
- Environmental pollutants
- Increased height velocity
- Obesity
- Insulin resistance*

*Evidence strengthening for an association
T1D, type 1 diabetes.
Mortality in Childhood-Onset T1D

- Mortality rate: 2.2/1000 person-years
- Most common cause of death <30 years of age
  - Acute metabolic complications of diabetes (eg, diabetic ketoacidosis)
- Most common cause of death >30 years of age
  - Cardiovascular disease

Development of Microalbuminuria and Macroalbuminuria in T1D

T1D Mortality Correlates With Renal Function

Risk of mortality in individuals with T1D associated each level of albuminuria and end-stage kidney disease.

Mortality in Patients With T1D

Swedish National Diabetes Register
(n=33,915 with T1D; n=169,249 without diabetes)

Mortality Risk vs Patients Without Diabetes

Mortality Risk by A1C Level

*Adjusted for age, diabetes duration, sex, birthplace, education, CVD status, and cancer status.

CVD, cardiovascular disease; T1D, type 1 diabetes.

**T1D-Related Mortality**

Swedish National Diabetes Register (n=33,915)

**Cause of Diabetes-Related Death, All Patients**

- **DKA**
- **Renal**
- **Vascular**
- **Multiple**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Patients (%)</th>
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<tbody>
<tr>
<td>DKA</td>
<td>14.5</td>
</tr>
<tr>
<td>Renal</td>
<td>9.2</td>
</tr>
<tr>
<td>Vascular</td>
<td>9</td>
</tr>
<tr>
<td>Multiple</td>
<td>67.2</td>
</tr>
</tbody>
</table>

**DKA Mortality**

- **Age (years)**
  - <30: 31.4
  - 30-40: 16.5
  - >40: 3.3

DKA, diabetic ketoacidosis; T1D, type 1 diabetes.

Rates of DKA Over 12 Month Period in Adults with T1D

T1D Exchange (N=7012)

P<0.001

DKA, diabetic ketoacidosis; T1D, type 1 diabetes.

Intensive Therapy Reduces Diabetes Complications Rates

DCCT (N=1441) and Pittsburgh Epidemiology of Diabetes Complications Study (N=161)

- Proliferative retinopathy: DCCT Conventional 50, DCCT Intensive 47, EDC 27
- Nephropathy: DCCT Conventional 25, DCCT Intensive 17, EDC 9
- Cardiovascular disease: DCCT Conventional 14, EDC 14, DCCT Intensive 9

Type 1 Diabetes Is Costly

Expected Lifetime Medical and Indirect Costs Attributed to T1D (2005 Dollars)

<table>
<thead>
<tr>
<th>Age of onset</th>
<th>Number of new patients</th>
<th>Medical (millions)</th>
<th>Income loss (millions)</th>
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<tbody>
<tr>
<td>3-9</td>
<td>6,483</td>
<td>$746</td>
<td>$1,208</td>
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<tr>
<td>10-19</td>
<td>11,980</td>
<td>$1,489</td>
<td>$2,923</td>
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<tr>
<td>20-29</td>
<td>3,528</td>
<td>$337</td>
<td>$1,130</td>
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<tr>
<td>30-39</td>
<td>3,976</td>
<td>$395</td>
<td>$1,279</td>
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<tr>
<td>40-45</td>
<td>2,464</td>
<td>$309</td>
<td>$776</td>
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<tr>
<td>Total</td>
<td>28,430</td>
<td>$3,276</td>
<td>$7,316</td>
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</tbody>
</table>

T1D, type 1 diabetes.
Hypoglycemia in Type 1 Diabetes Is Costly

T1D, type 1 diabetes.