The Impact of Diabetes Mellitus in the United States

Epidemiology, Costs, and Future Projections
29.1 million Americans, 9.3% of the population, have diabetes

- Diagnosed: 21.0 million
- Undiagnosed: 8.1 million
- 1.25 million have type 1 diabetes
- Leading cause of kidney failure, nontraumatic lower-limb amputation, new cases of blindness among adults
- Major cause of heart disease and stroke
- Seventh leading cause of death
1.7 million are newly diagnosed each year
28.9 million (12.3%) have diabetes

By age
- <20 years 208,000
- 20-44 4.3 million (4.1%)
- 45-64 13.4 million (16.2%)
- >65 years, 11.2 million (25.9%)

By sex
- Men: 15.5 million (13.6%)
- Women: 13.4 million (11.2%)
<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic whites</td>
<td>7.6</td>
</tr>
<tr>
<td>Asian Americans</td>
<td>9.0</td>
</tr>
<tr>
<td>Hispanics/Latinos</td>
<td>12.8</td>
</tr>
<tr>
<td>Cuban Americans</td>
<td>9.3</td>
</tr>
<tr>
<td>Central and South Americans</td>
<td>8.5</td>
</tr>
<tr>
<td>Mexican Americans</td>
<td>13.9</td>
</tr>
<tr>
<td>Puerto Ricans</td>
<td>14.8</td>
</tr>
<tr>
<td>Non-Hispanic whites</td>
<td>7.6</td>
</tr>
<tr>
<td>American Indians/Alaska Natives</td>
<td>15.9</td>
</tr>
</tbody>
</table>

2010-2012 data for people ages ≥20 Years or Older

Diagnosed and Undiagnosed Diabetes

Estimated percentage of people ages ≥20 years with diagnosed and undiagnosed diabetes, by age group, United States, 2012

<table>
<thead>
<tr>
<th>Age Group, Years</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-44</td>
<td>4.1%</td>
</tr>
<tr>
<td>45-64</td>
<td>16.2%</td>
</tr>
<tr>
<td>≥65</td>
<td>25.9%</td>
</tr>
</tbody>
</table>

Source: 2005-2008 National Health and Nutrition Examination Survey
New Cases of Diagnosed Diabetes

Estimated number of new cases of diagnosed diabetes among people ≥20 years, by age group, 2010

<table>
<thead>
<tr>
<th>Age Group, Years</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-44</td>
<td>371,000</td>
</tr>
<tr>
<td>45-64</td>
<td>892,000</td>
</tr>
<tr>
<td>≥65</td>
<td>400,000</td>
</tr>
</tbody>
</table>

Source: 2005-2008 National Health and Nutrition Examination Survey estimates projected to the year 2010
Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

**1994**

**Obesity (BMI≥30 kg/m²)**

- Missing Data
- 14.0%–17.9%
- 18.0%–21.9%
- 22.0%–25.9%

**Diabetes**

- Missing data
- 4.5%–5.9%
- 6.0%–7.4%
- 7.5%–8.9%
- ≥9.0%

Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

2004

Obesity (BMI≥30 kg/m²)

- Missing Data
- 14.0%–17.9%
- 18.0%–21.9%
- 22.0%–25.9%
- ≥26.0%

Diabetes

- Missing data
- 4.5%–5.9%
- 6.0%–7.4%
- 7.5%–8.9%
- ≥9.0%

Age-Adjusted Prevalence of Obesity and Diagnosed Diabetes Among US Adults

2013

Obesity (BMI≥30 kg/m²)

- Missing Data
- 14.0%–17.9%
- 18.0%–21.9%
- 22.0%–25.9%
- ≥26.0%

Diabetes

- Missing data
- 4.5%–5.9%
- 6.0%–7.4%
- 7.5%–8.9%
- ≥9.0%

Prevalence of Overweight and Obesity Among Adults with Diabetes

• CDC analysis of prevalence of overweight and obesity among U.S. adults ≥20 years with previously diagnosed diabetes
  – Overweight or obesity: 85.2%
  – Obesity: 54.8%

• Women aged 20-64 years had a significantly higher prevalence of obesity than women ≥65 years of age (64.7% vs 47.4%; \( P<0.05 \)) during 1999-2002

• Among men, prevalence of overweight or obesity was 86.3% and obesity, 53.0%
SEARCH for Diabetes in Youth 0-9 Years by Race/Ethnicity

Prevalence

NHW=non-Hispanic white; AA=African-American; H=Hispanic; API=Asian/Pacific Islander; AI=American Indian

SEARCH for Diabetes in Youth 10-19 Years by Race/Ethnicity

Prevalence

NHW=non-Hispanic white; AA=African-American; H=Hispanic; API=Asian/Pacific Islander; AI=American Indian

Incidence and Prevalence of Diabetes in Youth, 2012

- About 208,000 people younger than 20 have been diagnosed with diabetes (type 1 and type 2), about 0.25% of American youth.
- In 2008-2009, 18,436 people younger than 20 years in the U.S. newly diagnosed with type 1 diabetes annually, and 5,089 diagnosed with type 2 diabetes.

Prediabetes

- In 2009-2012, based on fasting glucose or A1C levels, prediabetes was detected in
  - 37% of adults ages 20 years and older
  - 51% of adults ages 65 years and older
  - An estimated 86 million adults ages 20 years and older
- People with prediabetes have an increased risk of developing type 2 diabetes, heart disease, and stroke

Complications of Diabetes

- Hypertension
- Hyperlipidemia
- Heart disease and stroke
- Blindness, eye problems
- Renal disease
- Amputations
- Other complications

Complications of Diabetes
Heart Disease, Stroke, Hypertension

- In 2009–2012, of adults aged ≥18 years with diagnosed diabetes, 71% had blood pressure ≥140/90 mmHg or used blood pressure medications.

- In 2003–2006 cardiovascular disease death rates were about 1.7 times higher among adults aged ≥18 with diagnosed diabetes than among adults without diagnosed diabetes.

- In 2010 hospitalization rates for heart attack were 1.8 times higher and stroke were 1.5 times higher among adults with diagnosed diabetes ≥20 compared to those without diagnosed diabetes.
Complications of Diabetes
Blindness, Eye Problems

• Diabetes is leading cause of new cases of blindness among adults ages 20–74 years

• Of people with diabetes aged ≥40 years, 4.2 million (28.5%) had diabetic retinopathy in 2005-2008

• 655,000 (4.4% of those with diabetes) had advanced diabetic retinopathy that could lead to severe vision loss

In 2011, diabetes was leading cause of kidney failure, accounting for 44% of all new cases of renal failure.

- 49,677 people with diabetes began treatment for end-stage renal disease (ESRD).
- 228,942 people with ESRD due to diabetes were living on chronic dialysis or with a kidney transplant.
Trends in age-standardized rates of diabetes-related complications among U.S. adults with diabetes, 1990-2010

Complications of Diabetes Nervous System Disease

• ~60%–70% of people with diabetes have mild to severe forms of nervous system damage
  – Impaired sensation or pain in feet or hands
  – Slowed digestion of food in the stomach
  – Carpal tunnel syndrome
  – Erectile dysfunction

• Severe forms are a major contributing cause of lower-extremity amputations: About 60% occur in people with diabetes ages ≥20
Treatment of Diabetes

- No medication: 14.4%
- Insulin only: 14.0%
- Insulin and oral medication: 14.7%
- Total: 56.9%

Deaths Among People with Diabetes

• In 2010, diabetes was the seventh leading cause of death based on death certificates
  – 69,071 underlying cause
  – 234,051 contributing cause
• Likely to be underreported as a cause of death
• Overall, risk for death among those with diabetes is about twice that of people with similar age but without diabetes
Age Distribution of Deaths Associated with Diabetes

- Age <18: 488 (0%)
- Age 18-34: 1,918 (1%)
- Age 35-44: 5,564 (2%)
- Age 45-54: 16,663 (6%)
- Age 55-59: 13,907 (5%)
- Age 60-64: 17,634 (6%)
- Age 65-69: 20,656 (7%)
- Age 70+: 206,791 (73%

Section 2

COSTS
Total cost of diabetes: $245 billion

- $176 billion in direct medical costs, which includes costs for hospital and emergency care, office visits, and medications.
- $69 billion in indirect medical costs, which includes costs for absenteeism, reduced productivity, unemployment
Medical Expenditures Attributed to Diabetes, 2012

- Hospital inpatient care (43%)
- Retail prescriptions to treat complications of diabetes (18%)
- Diabetes medication and supplies (12%)
- Physician office visits (9%)
- Nursing/residential facility stays (8%)

- The absolute cost of hospital inpatient care for people with diabetes rose from $58 billion in 2007 to $76 billion in 2012. However, hospital inpatient care costs fell from 50 percent to 43 percent of total direct medical costs.

Costs Incurred by People with a Diagnosis of Diabetes in 2012

- Average annual expenditures: $13,700
  - $7,900 attributed to directly to diabetes
- Medical expenditures for people with diabetes are 2.3 times higher than for those without diabetes.
  - More than 1 in 5 health care dollars in the U.S. goes to the care of people with diagnosed diabetes
  - More than 1 in 10 health care dollars in the U.S. are spent directly on diabetes and its complications

# Health Care Expenditures in the U.S Attributed to Diabetes, 2012

<table>
<thead>
<tr>
<th>Health resource</th>
<th>Dollars ($ millions)</th>
<th>% of U.S. total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital inpatient</td>
<td>75,872</td>
<td>16%</td>
</tr>
<tr>
<td>Nursing/residential facility</td>
<td>14,748</td>
<td>17%</td>
</tr>
<tr>
<td>Hospice</td>
<td>32</td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>Outpatient care</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office-based physician visits</td>
<td>15,221</td>
<td>8%</td>
</tr>
<tr>
<td>Emergency visits</td>
<td>6,654</td>
<td>6%</td>
</tr>
<tr>
<td>Ambulance services</td>
<td>218</td>
<td>11%</td>
</tr>
<tr>
<td>Hospital outpatient</td>
<td>5,027</td>
<td>6%</td>
</tr>
<tr>
<td>Home health</td>
<td>4,466</td>
<td>9%</td>
</tr>
<tr>
<td>Podiatry</td>
<td>212</td>
<td>12%</td>
</tr>
</tbody>
</table>

## Indirect Costs Attributed to Diabetes, 2012

<table>
<thead>
<tr>
<th>Cost component</th>
<th>Productivity loss</th>
<th>Total cost attributable to diabetes ($ billions)</th>
<th>Proportion of indirect costs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workdays absent</td>
<td>25 million days</td>
<td>5.0</td>
<td>7</td>
</tr>
<tr>
<td>Reduced performance at work</td>
<td>113 million days</td>
<td>20.8</td>
<td>30</td>
</tr>
<tr>
<td>Reduced productivity days for those not in labor force</td>
<td>20 million days</td>
<td>2.7</td>
<td>4</td>
</tr>
<tr>
<td>Reduced labor force participation due to disability</td>
<td>130 million days</td>
<td>21.6</td>
<td>31</td>
</tr>
<tr>
<td>Mortality</td>
<td>246,000 deaths</td>
<td>18.5</td>
<td>27</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>68.6</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
### Mortality Costs Attributed to Diabetes, 2012

<table>
<thead>
<tr>
<th>Primary cause of death</th>
<th>Total US deaths</th>
<th>Deaths attributed to diabetes</th>
<th>% of total of US deaths</th>
<th>Value of lost productivity ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>73,000</td>
<td>73,000</td>
<td>100.0</td>
<td>7,147</td>
</tr>
<tr>
<td>Renal disease</td>
<td>46,000</td>
<td>25,000</td>
<td>55.0</td>
<td>2,004</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>136,000</td>
<td>38,000</td>
<td>28.0</td>
<td>1,484</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>687,000</td>
<td>110,000</td>
<td>16.0</td>
<td>7,827</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>NA</strong>*</td>
<td><strong>246,000</strong></td>
<td><strong>NA</strong>*</td>
<td><strong>18,462</strong></td>
</tr>
</tbody>
</table>

*Total comprises mortality for reasons other than those listed here

Economic Costs of Prediabetes, GDM and Diabetes, 2012

- Total national cost: $322 billion
- Higher medical costs: $244 billion
- Productivity loss: $78 billion
  - $245 billion for diagnosed diabetes
  - $32.8 billion for undiagnosed diabetes
  - $43.9 billion for prediabetes
  - $1.3 billion for gestational diabetes

IDF Global Projections for Number of People with Diabetes, 2010-2030

<table>
<thead>
<tr>
<th>REGION</th>
<th>2010 Millions</th>
<th>2030 Millions</th>
<th>INCREASE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>12.1</td>
<td>23.9</td>
<td>98%</td>
</tr>
<tr>
<td>Middle East and North Africa</td>
<td>26.6</td>
<td>51.7</td>
<td>94%</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>58.7</td>
<td>101.0</td>
<td>72%</td>
</tr>
<tr>
<td>South and Central America</td>
<td>18.0</td>
<td>29.6</td>
<td>65%</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>76.7</td>
<td>112.8</td>
<td>47%</td>
</tr>
<tr>
<td>North America and Caribbean</td>
<td>37.4</td>
<td>53.2</td>
<td>42%</td>
</tr>
<tr>
<td>Europe</td>
<td>55.2</td>
<td>66.2</td>
<td>20%</td>
</tr>
<tr>
<td>World</td>
<td>284.6</td>
<td>438.4</td>
<td>54%</td>
</tr>
</tbody>
</table>
### Estimated Number of People with Diabetes Worldwide, 2010 and 2030

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>2010 Millions</th>
<th>Country/Territory</th>
<th>2030 Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 India</td>
<td>50.8</td>
<td>1 India</td>
<td>87.0</td>
</tr>
<tr>
<td>2 China</td>
<td>43.2</td>
<td>2 China</td>
<td>62.6</td>
</tr>
<tr>
<td>3 USA</td>
<td>26.8</td>
<td>3 USA</td>
<td>36.0</td>
</tr>
<tr>
<td>4 Russian Federation</td>
<td>9.6</td>
<td>4 Pakistan</td>
<td>13.8</td>
</tr>
<tr>
<td>5 Brazil</td>
<td>7.6</td>
<td>5 Brazil</td>
<td>12.7</td>
</tr>
<tr>
<td>6 Germany</td>
<td>7.5</td>
<td>6 Indonesia</td>
<td>12.0</td>
</tr>
<tr>
<td>7 Pakistan</td>
<td>7.1</td>
<td>7 Mexico</td>
<td>11.9</td>
</tr>
<tr>
<td>8 Japan</td>
<td>7.1</td>
<td>8 Bangladesh</td>
<td>10.4</td>
</tr>
<tr>
<td>9 Indonesia</td>
<td>7.0</td>
<td>9 Russian Federation</td>
<td>10.3</td>
</tr>
<tr>
<td>10 Mexico</td>
<td>6.8</td>
<td>10 Egypt</td>
<td>8.6</td>
</tr>
</tbody>
</table>
Annual U.S. Diabetes Burden in 2050

• By 2050, prevalence of total diabetes (diagnosed and undiagnosed) is projected to increase from 1 in 10 adults to between 1 in 5 and 1 in 3 adults
• Incidence: from 8 in 1000 to 15 in 1000
• Largely attributed to three key factors
  – Aging of the U.S. population
  – Increasing size of higher-risk minority populations
  – Declining mortality among those with diabetes

Total U.S. Adult Population Diabetes Prevalence Projections

Middle: \( r_1 = 1.77, r_2 = 2.11 \)

Middle: \( r_1 = 1.00, r_2 = 4.08 \)

Low: \( r_1 = 1.77, r_2 = 2.11 \)

Low: \( r_1 = 1.00, r_2 = 4.08 \)