Understanding the Science of Type 2 Diabetes

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Biological Sciences Curriculum Study (BSCS)

- Founded in 1958 as a curriculum study
- Committed to an evidence-based approach to science education
- Inquiry-based science education
- High-quality science curriculum & professional development
- Rigorous research and evaluation studies
You can access the PowerPoint slides for this presentation at www.bscs.org/sessions beginning Tuesday April 3, 2012
Diabetes—
Why Do We Care?

With 2-3 colleagues,

1. Introduce yourselves
2. Discuss the data you are given
3. Be ready to share
   - 1-2 conclusions from your data
   - 1 question that the data raise for your group

Percentage of U.S. Adults With Diagnosed Diabetes

1994

2000

2009

Rate of new cases of diabetes among youth aged <20 years, 2002–2005

NHW=non-Hispanic whites; NHB=non-Hispanic blacks; H=Hispanics; API=Asians/Pacific Islanders; AI=American Indians

Source: SEARCH for Diabetes in Youth Study
Types of Diabetes

**Type 1 Diabetes**

- Formerly called juvenile diabetes or insulin-dependent diabetes
- The beta cells of the pancreas no longer make insulin
- Considered an autoimmune disease

**Type 2 Diabetes**

- Formerly called adult-onset or noninsulin-dependent diabetes
- Pancreas produces insulin (at least initially) but cells cannot use it properly
The Diabetes Education Curriculum K-12 (DECK-12) Project
NIDDK’s Goals for the DECK-12 Supplements

NIDDK wants to develop curriculum supplements that will help African American and Hispanic students

- Increase knowledge and awareness of type 2 diabetes, its complications, risk factors and self-management principles;
- Improve diabetes prevention and self-management behaviors and skills; and
- Increase interest in science and health related careers.
Diabetes in the Hispanic/Latino Population

- As of 2008, 2.5 million Hispanic adults, 18 years and older, about 11 percent of that population, have diabetes.
- Hispanics are 1.5 times as likely to have diabetes as Whites. Mexican Americans are almost twice as likely to have diagnosed diabetes than U.S. non-Hispanic whites.
- Hispanics have higher rates of end-stage renal disease, caused by diabetes.
- Hispanics are 50% more likely to die from diabetes as non-Hispanic whites.
Diabetes in the African American Population

• On average, African American adults are twice as likely than non-Hispanic white adults to have been diagnosed with diabetes.

• When adjusted for age, African American women are more likely to be diagnosed with diabetes than non-Hispanic whites, African American men, or Hispanics.

• African Americans with diabetes are more likely to experience complications of diabetes. End-stage renal disease and amputations are also more common in African Americans with diabetes.

• In 2006, African Americans were 2.3 times as likely as non-Hispanic whites to die from diabetes.
Diabetes in Youth

• In a national study of 2,000 eighth-grade students from communities at high risk for diabetes, more than half of the kids were overweight or obese. Only 1 percent had diabetes, but almost a third of them had pre-diabetes.

• The chance of serious complications increases the longer a person has the disease.

• Treatments for type 2 diabetes in youth are not well defined. In addition, the effectiveness of oral medications decreases over time. This is important if people start taking these medications earlier and rely on them for many years.
DECK-12 Products To Be Developed

- Seven curriculum units
  - 3 for grades K-5
  - 2 for grades 6-8
  - 2 for grades 9-12

- Outreach guide
  - Connecting school to family

- Informational website
  - General information
  - Supplemental content
What We Want Students To Learn

Enduring Understanding for all learners:
Type 2 diabetes is a preventable or manageable disease.

Biology Thread:
Type 2 diabetes is a disruption in the way the body functions.

Lifestyle and Behavior Thread:
Type 2 diabetes can often be prevented by changes in lifestyle.
An Activity from the High School Science Unit
The DPP was a major multicenter clinical research study aimed at determining whether changes in lifestyle or the use of an oral diabetes medication could prevent or delay the onset of type 2 diabetes.
The DPP: The Participants

3,234 participants
all were overweight
all had high fasting blood glucose levels (pre-diabetes)
ranged in age from 25 to over 85 years of age
included both males (32%) and females (68%)
represented many racial and ethnic groups (overall 45% from minority groups)
The DPP: Groups

Lifestyle Intervention Group
- received intensive help from dietitians and physical trainers with goals of
  - increasing physical activity
  - losing 7 percent of body weight

Metformin Group
- received information (but no intensive help) about lifestyle changes
  - took the drug metformin twice a day

Placebo Group
- received information (but no intensive help) about lifestyle changes
  - took a placebo pill twice a day
The health of the participants was followed for about three years. Researchers kept track of how many people in each group developed type 2 diabetes during the next three years.
### The Results of the Study

<table>
<thead>
<tr>
<th>Type 2 Diabetes</th>
<th>Placebo</th>
<th>Metformin</th>
<th>Lifestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incidence of diabetes</strong> (number of cases per 100 person-years)</td>
<td>11.0</td>
<td>7.8</td>
<td>4.8</td>
</tr>
<tr>
<td><strong>Percent reduction in incidence of diabetes</strong> (compared with placebo)</td>
<td>--</td>
<td>31</td>
<td>58</td>
</tr>
<tr>
<td><strong>Percent reduction in incidence</strong> (compared with metformin)</td>
<td>--</td>
<td>--</td>
<td>29</td>
</tr>
</tbody>
</table>
The DPP: Analyzing the Data

• Work with 2-3 colleagues to analyze one subset of Data
  – Age
  – BMI
  – Race and Ethnicity
  – Sex

• Be ready to share your conclusions!
## DPP Results: Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Incidence (number of cases per 100 person-years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Placebo</td>
</tr>
<tr>
<td>25 to 44 years</td>
<td>11.6</td>
</tr>
<tr>
<td>45 to 59 years</td>
<td>10.8</td>
</tr>
<tr>
<td>60 years and older</td>
<td>10.8</td>
</tr>
</tbody>
</table>
## DPP Results: Body Mass Index

<table>
<thead>
<tr>
<th>Body-mass index*</th>
<th>Incidence (Number of Cases per 100 person-year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Placebo</td>
</tr>
<tr>
<td>BMI 22 to 29</td>
<td>9.0</td>
</tr>
<tr>
<td>BMI 30 to 34</td>
<td>8.9</td>
</tr>
<tr>
<td>BMI 35 or higher</td>
<td>14.3</td>
</tr>
</tbody>
</table>
## DPP Results: Race and Ethnicity

<table>
<thead>
<tr>
<th>Race or ethnic group</th>
<th>Incidence (number of cases per 100 person-year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Placebo</td>
</tr>
<tr>
<td>White</td>
<td>10.3</td>
</tr>
<tr>
<td>African American</td>
<td>12.4</td>
</tr>
<tr>
<td>Hispanic</td>
<td>11.7</td>
</tr>
<tr>
<td>American Indian</td>
<td>12.9</td>
</tr>
<tr>
<td>Asian</td>
<td>12.1</td>
</tr>
</tbody>
</table>
### DPP Results: Sex

<table>
<thead>
<tr>
<th>Sex</th>
<th>Placebo</th>
<th>Metformin</th>
<th>Lifestyle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12.5</td>
<td>8.1</td>
<td>4.6</td>
</tr>
<tr>
<td>Female</td>
<td>10.3</td>
<td>7.6</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Incidence (number of cases per 100 person-years)
The Diabetes Education Curriculum K-12 (DECK-12) Project
The DECK-12 Program

Each unit within the DECK-12 series will include:

- Print-based and web-based activities
- Detailed lesson plans and procedures
- Background information for the teacher
- Copymasters for any student materials
- Implementation support
- Embedded assessments
- Correlation to national standards
Pilot Testing
Pilot-Test Teacher Orientation
Next Steps
Field Testing
the DECK-12 Curriculum

• We will be field-testing the seven curriculum units in the DECK-12 project this fall!

• Selection of field-test teachers will occur in April and May. Please let us know if you are interested.
How can I follow the progress of the DECK-12 project?

- Sign up to be part of the BSCS e-mailing list or watch the BSCS website for periodic updates.

When will the DECK-12 units be finished?

- Fall, 2013

How much will they cost?

- The units will be FREE!

Other?
Thank You!
Please contact us if you have any questions!
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www.bscs.org/sessions