Juvenile Diabetes Cure Research Tax Check-Off Program Annual Report

Jan. 1 – Dec. 31, 2012

pennsylvania
DEPARTMENT OF HEALTH

Tom Corbett, Governor

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Juvenile Diabetes Cure Research Tax Check-Off Program

Created in September 2004 with the passage of Act 133, Juvenile Diabetes Cure Research, the Juvenile Diabetes Cure Research Tax Check-Off Program provides a state income tax check-off option for individuals to contribute a portion of their state tax refund to support research for juvenile diabetes, more commonly known as type 1 diabetes. The Program funds research grants focused on restoring normal blood levels, preventing and reversing complications of the disease, and/or prevention of juvenile diabetes.

Type 1 Diabetes Overview

Type 1 diabetes, previously known as insulin-dependent diabetes mellitus (IDDM), or juvenile-onset diabetes, is an auto-immune disease in which the immune system destroys the insulin-producing beta cells of the pancreas that regulate blood glucose. As a result, the pancreas no longer produces insulin, the hormone needed to convert sugar (glucose), starches and other foods into energy needed for living. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. In adults, type 1 diabetes accounts for approximately 5 percent of all diagnosed cases of diabetes. Risk factors may be autoimmune, genetic or environmental, but the exact cause of type 1 diabetes is unknown, with no known way to prevent it. In addition, there is no cure.

Type 1 diabetes comes on suddenly, causes dependence on injected or pumped insulin for life, and carries the constant threat of devastating complications. While insulin injections or infusions allow a person with type 1 diabetes to stay alive, they do not cure diabetes, nor do they necessarily prevent the possibility of the disease's devastating effects, which may include kidney failure, blindness, nerve damage, heart attack, stroke and amputations. Research focused on type 1 diabetes provides hope to detect its causes and to find a cure.

The Scope of Diabetes: About 1.9 million people aged 20 years or older were newly diagnosed with diabetes in 2010 in the United States.[1]

The Cost of Diabetes: Nearly one-third of every Medicare dollar is spent on people with diabetes.[2]

The Harm Caused by Diabetes: Adults with diabetes have heart disease death rates about two to four times higher than adults without diabetes. Diabetes is the leading cause of new cases of blindness among adults aged 20-74. Diabetes is the leading cause of kidney failure.[1]

Diabetes Statistics

In 2011, the World Health Organization reported that non-communicable diseases (NCDs) killed 63 percent of people who died worldwide in 2008. Cardiovascular diseases account for most NCD deaths, or 17 million people annually, followed by cancer (7.6 million), respiratory disease (4.2 million) and diabetes (1.3 million). These four groups of diseases account for about 80 percent of all NCD deaths and share four common risk factors: tobacco use, physical inactivity, the harmful use of alcohol and poor diets.[3]

- According to the Centers for Disease Control and Prevention (CDC), it is estimated that 25.8 million people of all ages in the United States have diabetes (with 18.8 million diagnosed and seven million undiagnosed).[1]
- In adults, type 1 diabetes accounts for approximately 5 percent of all diagnosed cases of diabetes.[1]
- After adjusting for population age and sex differences, average medical expenditures among people with diagnosed diabetes were 2.3 times higher than expenditures would be in the absence of diabetes.[1]

- Diabetes was the seventh leading cause of death based on U.S. death certificates in 2007.[1]
- Diabetes and its complications are the seventh leading cause of death in Pennsylvania, responsible for 3,229 Pennsylvania deaths in 2009 – which could be expressed as an average of nine deaths per day.[4]
- Between 899,000 and 999,000 adults age 18+ in Pennsylvania (9-10 percent of the target population) are estimated to have been diagnosed with diabetes. [5]

New Cases of Diagnosed Diabetes

New cases of diagnosed diabetes among people younger than 20 years of age, US, 2002–2005[1]

SEARCH for Diabetes in Youth is a multicenter study funded by CDC and the National Institute of Health (NIH) to examine diabetes (type 1 and type 2) among children and adolescents in the United States. SEARCH findings for the communities studied include the following:

- During 2002–2005, 15,600 youth were newly diagnosed with type 1 diabetes annually, and 3,600 youth were newly diagnosed with type 2 diabetes annually.
- Among youth aged <10 years, the rate of new cases was 19.7 per 100,000 each year for type 1 diabetes and 0.4 per 100,000 for type 2 diabetes. Among youth aged 10 years or older, the rate of new cases was 18.6 per 100,000 each year for type 1 diabetes and 8.5 per 100,000 for type 2 diabetes.
- Non-Hispanic white youth had the highest rate of new cases of type 1 diabetes (24.8 per 100,000 per year among those younger than 10 years and 22.6 per 100,000 per year among those aged 10–19 years).
- Type 2 diabetes was extremely rare among youth aged <10 years. While still infrequent, rates were greater among youth aged 10–19 years than in younger children, with higher rates among U.S. minority populations than in non-Hispanic whites.
- Among non-Hispanic white youth aged 10–19 years, the rate of new cases was higher for type 1 than for type 2 diabetes. For Asian/Pacific Islander and American Indian youth aged 10–19 years, the opposite was true — the rate of new cases was greater for type 2 than for type 1 diabetes. Among non-Hispanic black and Hispanic youth aged 10–19 years, the rates of new cases of type 1 and type 2 diabetes were similar.

Rate of new cases of type 1 and type 2 diabetes among youth aged < 20 years, by race/ethnicity, 2002-2005

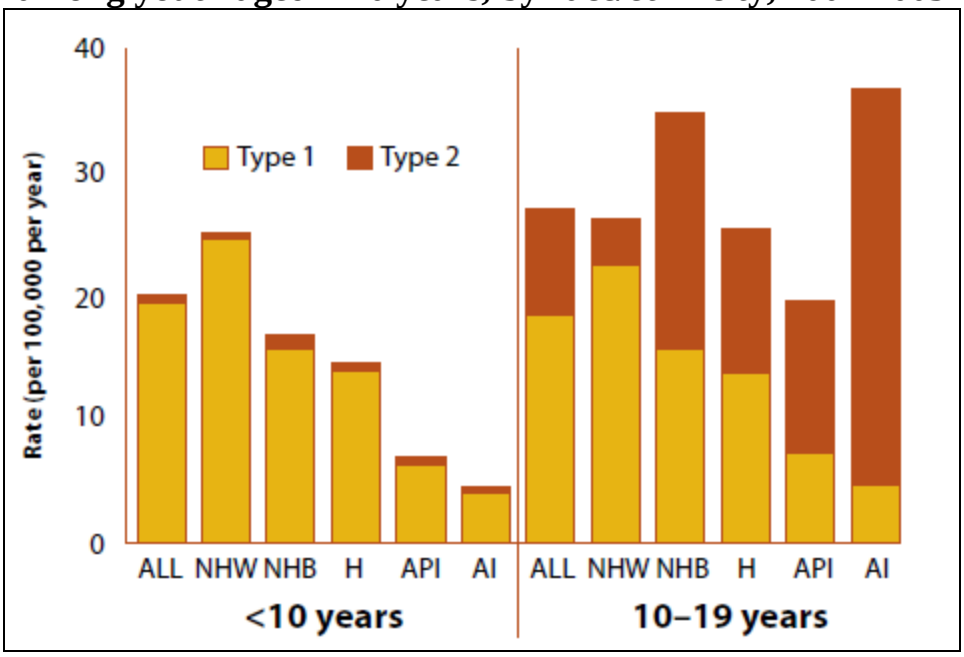

Figure 1: New Cases of Diagnosed Diabetes
Source: SEARCH for Diabetes in Youth Study
NHW=non-Hispanic whites; NHB=non-Hispanic blacks; H=Hispanics; API=Asians/Pacific Islanders; AI=American Indians

Diabetes Costs Overview

Diabetes is one of the costliest chronic diseases. Medical expenses for people with diabetes are more than two times higher than for people without diabetes.[1] It is important to note that diabetes can go undetected for quite some time. Therefore, the percentage of Pennsylvania adults with diabetes was likely higher than 9 percent in 2011.

- National Estimated Diabetes Costs for 2007[1]
  - ✓ Total (direct and indirect): $174 billion
  - ✓ Direct medical costs: $116 billion
  - ✓ Indirect costs: $58 billion (disability, work loss, premature mortality)

- Pennsylvania Estimated Diabetes Costs for 2007[6]
  - ✓ Hospitalizations for which diabetes was the principal diagnosis incurred over $833 million in hospital charges and accounted for over 132,200 hospital days.
  - ✓ From 2003 to 2007, total costs for diabetes-related hospital charges in Pennsylvania have reached more than $3.6 billion and accounted for over 663,000 days in the hospital.

Administration of the Program

The Pennsylvania Department of Health Diabetes Prevention and Control Program is responsible for the administration of the Juvenile Diabetes Cure Research Tax Check-Off Program. A $100,000 two-year grant was awarded to The Pennsylvania State University College of Medicine to conduct research to understand the molecular basis for vision impairment in diabetic retinopathy for patients with type 1 diabetes. Research began Jan. 1, 2009, and ended on Dec. 31, 2010. A second two-year grant for $150,000 was awarded to The Pennsylvania State University Department of Pharmacology to conduct vision impairment diabetic retinopathy research. Research began July 1, 2012, and will end on June 30, 2014.

Significant progress has been made using these funds, and the eventual significance of this research on public health outcomes could be enormous. The results of these studies have led to published manuscripts that describe roles for altered lipids and enzyme inhibition in diabetic retinopathy and complications. A list of these manuscripts is found on page 7.

In the first grant, The Pennsylvania State University College of Medicine has leveraged their findings for additional extramural funding as a bridge to national research funding from the National Institutes of Health (NIH) and American Diabetes Association (ADA):

1) National Institutes of Health National Eye Institute – The Role of Glycosphingolipids in Diabetic Retinopathy
2) American Diabetes Association – Therapeutically modulating glycosphingolipid metabolism in a model of type 1 diabetes

PSU Department of Pharmacology has incorporated further exploration of the role of diminished caveolin-1 in ocular inflammation and vascular leakage in the present grant and is attempting to leverage these funds.

Research Results from the Program

PSU College of Medicine Grant:

Results from the first grant indicated that too much of a type of glycolipid in the type 1 diabetic retinas of both rat and mouse models causes insulin to fail to be processed properly, as well as causing detrimental effects of inflammation, vascular dysfunction and neuronal cell death. An enzyme called glucosylceramide synthase (GCS) catalyzes the reaction that creates glucosylceramide in the retina. Juvenile Diabetes Cure Research Tax Check-Off Program grant funds were successfully used to identify and validate GCS as a target in reducing or eliminating diabetic complications.

PSU Department of Pharmacology Grant:

The title of the new grant is "Studies to Verify Dysfunctional Toll-like Receptor Signaling and Diabetic Retinopathy." Studies were initiated in July 2012 to quantify the expression, cell-type and lipid microdomain localization of Toll-Like Receptors (TLRs) in the diabetic retina. The grantee reports significant progress in establishing the models and validating the tools necessary to accomplish the task. The major goals of this grant are to A) identify the major alterations of inflammatory TLRs in the diabetic retina and B) to validate that TLRs contribute to diabetic retinopathy.

Plans for Fiscal Year 2013-2014

The Diabetes Prevention and Control Program (DPCP) is currently deciding whether to initiate the process to issue a Request for Application (RFA) in 2013 or to exercise its option to renew the current grant in 2014. If DPCP issues an RFA, proposed projects must have been subject to an established peer and scientific review process identical or similar to the National Institutes of Health review system. The purpose of the resulting grant will be to conduct research that focuses on juvenile diabetes as it relates to restoring normal blood levels, preventing and reversing complications from the disease, and/or preventing juvenile diabetes. Research funds from the program are restricted to institutions of higher education and independent research institutes of the Commonwealth of Pennsylvania.

Tax Check-Off/Private Contributions

Tax Year 2011 (Calendar Year 2012) was the seventh year in which contributions were collected for this fund. Contributions to the fund in 2012 totaled $49,983.75. These annual contributions are displayed below in Figure 1. Total Revenue through Dec. 31, 2012, was $418,351.88, and the cumulative balance was $172,421.88.

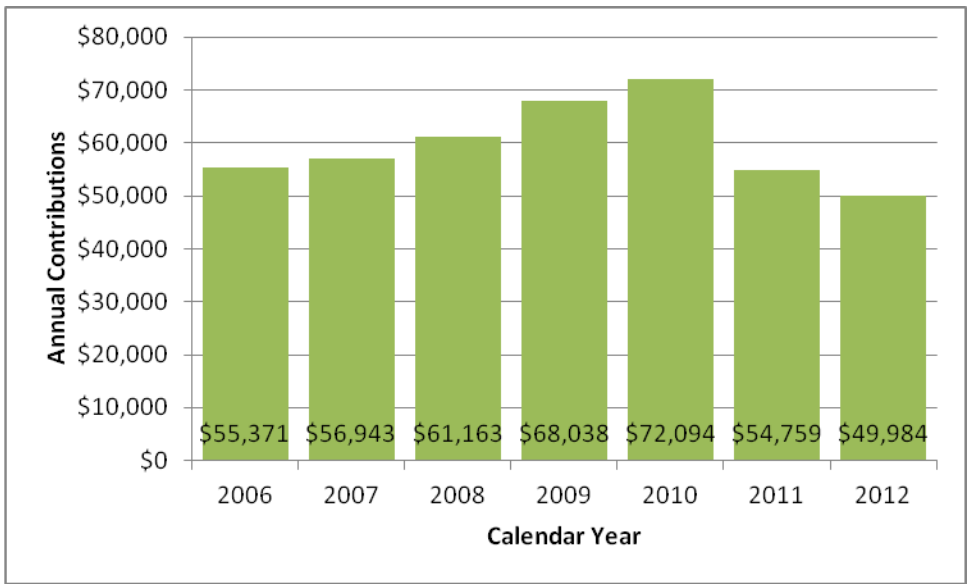

Figure 2: Annual contributions made in calendar years 2006-2012

How to Contribute to the Program Fund

Individuals may indicate the amount of their state tax refund they wish to contribute to the Juvenile (Type 1) Diabetes Cure Research Fund. Contributions may be made payable to the Juvenile Diabetes Cure Research Fund and sent to:

Pennsylvania Department of Health
Bureau of Administrative and Financial Services
Division of Budget
625 Forster St.
Health and Welfare Building
Harrisburg, PA 17120

For Additional Information

This report was prepared by the Diabetes Prevention and Control Program, Division of Nutrition and Physical Activity, Bureau of Health Promotion and Risk Reduction, Pennsylvania Department of Health. For additional information, contact:

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Diabetes Prevention and Control Program
625 Forster St., Room 1000, Health and Welfare Building
Harrisburg, PA, 17120
717-787-5876
www.health.state.pa.us/diabetes

For additional information regarding type 1 diabetes, including managing the disease and current research being conducted, please visit the following:

- Centers for Disease Control and Prevention, http://www.cdc.gov/diabetes;
- American Diabetes Association, http://www.diabetes.org;
- Juvenile Diabetes Research Foundation, http://www.jdrf.org; and
- SEARCH for Diabetes in Youth, http://www.searchfordiabetes.org.

References

1. Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011. Note: This publication is not subject to copyright restrictions; please duplicate and distribute copies as desired. http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf

2. COUNTDOWN News about Juvenile Diabetes Research Foundation's (JDRF) progress toward better treatments and a cure for type 1 diabetes. Juvenile Diabetes Research

Foundation. March 2011. Available online at: http://countdown.jdrf.org/ResearchHighlights.aspx?id=4294967352 Retrieved 4/18/12.

3. New World Health Organization (WHO) report: deaths from noncommunicable diseases on the rise, with developing world hit hardest. News release, 27 April 2011, Moscow, Paul Garwood, Communications Officer http://www.who.int/mediacentre/news/releases/2011/ncds_20110427/en/index.html

4. Bureau of Health Statistics and Research, Pennsylvania Department of Health, Pennsylvania Vital Statistics, 2009.

5. Pennsylvania Population Census Estimate and 2011Pennsylvania Behavioral Risk Factor Surveillance System.

6. The Burden of Diabetes in Pennsylvania 2010, Pennsylvania Department of Health, http://www.portal.state.pa.us/portal/server.pt/community/diabetes/14160/diabetes_publications___documents/557820 .

Manuscript List

1. Fox TE, Han X, Kelly S, Merrill AH 2nd, Martin RE, Anderson RE, Gardner TW, Kester M. "Diabetes alters sphingolipid metabolism in the retina: a potential mechanism of cell death in diabetic retinopathy" (DIABETES is the publication that contains the original article that provided initial data for this grant). Accepted Aug. 24, 2006.

2. Fox TE, Bewley MC, Unrath KA, Pedersen MM, Anderson RE, Kim JK, Bronson SK, Flanagan JM, Kester M. "Circulating sphingolipid biomarkers in models of Type 1 diabetes" (The Journal of Lipid Research) March 2011 52(3):509-17.

3. Fox TE, Young MM, Kester M, Gardner TW. "Insulin Signaling in Retinal Neurons is Regulated Within Cholesterol-enriched Membrane Microdomains" (American Journal of Physiology) First published Jan. 4, 2011.

4. Fox TE, Kester M. "Therapeutic strategies for diabetes and complications: a role for sphingolipids?" (Advances in Experimental Medicine and Biology) July 19, 2010.

5. Fox TE, Young MM, Pedersen MM, Han X, Gardner TW, Kester M. "Diabetes diminishes phosphatidic acid in the retina: implications for reduced mTOR signaling and increased neuronal cell death in diabetic retinopathy" (under peer review at Investigative Ophthalmology and Visual Science).

6. Kaiser JM, Imai H, Haakenson JK, Brucklacher RM, Fox TE, Shanmugavelandy SS, Unrath KA, Pedersen MM, Dai P, Willard MF, Bronson SK, Gardner TW, Kester M. "Nanoliposomal Minocycline for Ocular Drug Delivery" (Nanomedicine). www.ncbi.nlm.nih.gov/pubmed/22465498; March 28, 2012.

Pennsylvania Health Care Cost Containment Council (PHC4) Disclaimer

The Pennsylvania Health Care Cost Containment Council (PHC4) is an independent state agency responsible for addressing the problem of escalating health costs, ensuring the quality of health care and increasing access to health care for all citizens regardless of ability to pay. PHC4 has provided data to the Pennsylvania Department of Health in an effort to further PHC4's mission of educating the public and containing health care costs in Pennsylvania. PHC4, its agents, and staff, have made no representation, guarantee or warranty, express or implied, that the data -- financial, patient, payor and physician specific information -- provided to this entity, are error-free, or that the use of the data will avoid differences of opinion or interpretation. This analysis was not prepared by PHC4. This analysis was done by the Pennsylvania Department of Health. PHC4, its agents and staff, bear no responsibility or liability for the results of the analysis, which are solely the opinion of this entity.