Women of Color Health Information Collection

Diabetes Mellitus

Office of Research on Women's Health Women of Color Health Information Collection: Diabetes Mellitus

The Office of Research on Women's Health (ORWH), established in September 1990 within the Office of the Director, National Institutes of Health (NIH), works in partnership with the NIH Institutes and Centers (ICs) to ensure that women's health research is part of the scientific framework at NIH and throughout the scientific community. ORWH collaborates with the Advisory Committee on Research on Women's Health (ACRWH), comprising physicians, scientists, and other health professionals; and the Coordinating Committee on Research on Women's Health (CCRWH), composed of the NIH IC Directors or their designees.

The ORWH mission is to:

- advise the NIH Director and staff on matters relating to research on women's health;

- strengthen and enhance research related to diseases, disorders, and conditions that affect women;

- ensure that research conducted and supported by NIH adequately addresses issues regarding women's health;

- ensure that women are appropriately represented in biomedical and biobehavioral research studies supported by NIH;

- develop opportunities for and support recruitment, retention, re-entry, and advancement of women in biomedical careers; and

- support research on women's health issues.

Additional information on the mission and programs supported by ORWH can be found at http://orwh.od.nih.gov/.

INTRODUCTION

The Women of Color Health Information Collection serves to highlight the importance of women's health recognizing the role of culture, race/ethnicity, socioeconomic background, geographic location, and other factors as important contributors to the health status of women of diverse backgrounds. Data on the health status of women of color is not readily available from a single source. Although clinical trials and population-based surveys may include diverse populations, many do not report results disaggregated by sex and race/ethnicity or for minority subpopulations. A variety of sources have been included in this series to provide a description of various diseases and conditions in women of color. This information will be of value to scientists, advocates, clinicians, and policymakers in understanding the health status of women of color in this country in order to formulate policies and research priorities, and to develop and implement clinical practices which promote the health of all women.

The ultimate goal of biomedical research is to increase knowledge through sound science to inform the development of policies and clinical practice standards from which all women and men can benefit. The expanded concepts of women's health, and therefore research, focus on the study and understanding of women's health as a reflection of the myriad elements that contribute to the overall quality of women's lives in the United States today. A challenge inherent to women's health research is to establish a scientific knowledge base that will permit reliable diagnoses and effective prevention and treatment strategies appropriate for all women, including those of diverse racial/ethnic backgrounds. There is a need for a better understanding of how sex, gender, and cultural and racial/ethnic differences influence the pathobiology, etiology, diagnosis, progression, treatment, and outcomes of diseases among different populations.

The twenty years since the establishment of the NIH Office of Research on Women's Health in 1990 have seen increased attention to women's health issues and the establishment of other federal offices, programs, legislation, and policies to foster the study of women's health issues and to promote the inclusion of women and minorities in clinical research. These changes reflect the recognition that in order for the results of biomedical and behavioral research to be widely applicable, researchers and clinicians must consider how cultural, racial, and ethnic differences may influence the causes, diagnoses, prognosis, treatment, and outcomes of diseases among different populations in the design and conduct of research and the delivery of health care.

NIH funded clinical research must include women and minorities as scientifically appropriate as mandated by public law (NIH Revitalization Act of 1993, Public Law 103-43). NIH recognizes that there are barriers to recruiting and retaining women of diverse backgrounds as research subjects. Such barriers include the need for cultural diversity among researchers, promotion of collaborative relationships between researchers and communities, overcoming logistical problems related to women's roles as caregivers and in the workplace, and an appreciation of cultural beliefs of potential research participants. As part of the NIH Inclusion policy, and as stated in the 1993 Revitalization Act, cost is not justification for exclusion of women and/or minorities as participants in clinical research.

Just as sex/gender must be incorporated in the design of clinical research studies if the results of such research are to be widely applied through health care policies and interventions, so too must racial, ethnic, and cultural factors be taken into account in the design and conduct of research protocols.

WOMEN OF COLOR IN THE U.S. POPULATION

Of the approximately 307 million estimated U.S. residents in 2009, about 51 % were women, according to the U.S. Census Bureau, as shown in Table 1. There is increasing racial and ethnic diversity in the U.S. with a growing population of non-White women. The Census Bureau estimated that in 2009, almost 11 % of women in the U.S. were non-White, and Hispanic women constituted 7.61 % of the total U.S. population. (1)

Table 1: Total and Female Population of the United States by Race and Hispanic Origin (Estimated for 2009 based on 2000 Census Data)

Race and Hispanic Origin	Both Sexes	Female % of Total Population	Female
Total U.S. Population (Hispanic and Non-Hispanic)	307,006,550	50.67%	155,557,060
White	244,298,393	40.08%	123,062,670
Black	39,641,060	8.48%	20,704,909
AI/AN	3,151,284	0.51%	1,569,803
Asian	14,013,954	2.36%	7,244,461
NH/PI	578,353	0.09%	284,281
Two or more races	5,323,506	0.88%	2,690,936
Hispanic (Total)	48,419,324	48.25%	23,362,405
White	44,447,153	44.18%	21,392,163
Black	1,959,516	2.04%	990,111
AI/AN	790,477	0.77%	373,571
Asian	327,871	0.34%	163,503
NH/PI	129,843	0.13%	61,229
Two or more races	764,464	0.79%	381,828
Non-Hispanic (Total)	258,587,226	51.12%	132,194,655
White	199,851,240	39.32%	101,670,507
Black	37,681,544	7.62%	19,714,798
AI/AN	2,360,807	0.46%	1,196,232
Asian	13,686,083	2.74%	7,080,958
NH/PI	448,510	0.09%	223,052
Two or more races	4,559,042	0.89%	2,309,108

Adapted from Annual Estimates of the Resident Population by Sex, Race, and Hispanic Origin for the United States: April 1, 2000 to July 1, 2009 (NC-EST2009-03). http://www.census.gov/popest/national/asrh/NC-EST2009-srh.html. Date Accessed: September 10, 2010.

Hispanic origin is considered an ethnicity, not a race. Hispanics may be of any race.

LEADING CAUSES OF DEATH IN FEMALES

The seven leading causes of death of women in the U.S. are heart disease, cancer, stroke, chronic lower respiratory disease, Alzheimer's disease, unintentional injuries, and diabetes. Based on 2006 data from the U.S. Centers for Disease Control and Prevention (CDC), shown in Table 2, heart disease is the leading cause of death for African American, White, and Hispanic women in the U.S.; cancer is the leading cause of death for American Indian/ Alaska Native and Asian/Pacific Islander women. (2)

Table 2: Leading Causes of Death in Females for the United States in 2006 by Percentage*

Condition	All	American Indian/ Alaska Native	Asian/Pacific Islander	Black	White	Hispanic
Heart disease	**25.8**	18.8	22.7	**25.5**	**26.0**	**22.8**
Cancer	22.0	**19.2**	**27.2**	21.6	22.0	21.7
Stroke	6.7	4.9	9.3	6.8	6.7	6.4
Chronic lower respiratory diseases	5.3	4.3	2.4	2.5	5.8	2.7
Alzheimer's disease	4.2		2.2	2.3	4.5	2.7
Unintentional injuries	3.5	8.1	3.8	3.1	3.5	5.0
Diabetes	3.0	7.0	3.8	5.0	2.7	5.4

Adapted from CDC, Office of Women's Health. Leading Causes of Death in Females United States, 2006. http://www.cdc.gov/women/lcod/06_females_by_race.pdf . Date Accessed: September 10, 2010.

*The data represent the percent of total deaths in the race category due to the disease indicated. The racial groups (White, Black, American Indian/Alaska Native, and Asian/Pacific Islander) include persons of Hispanic and non-Hispanic origin. Persons of Hispanic origin may be of any race.

Leading causes of death for each race/ethnicity are in bold font.

Background

Diabetes mellitus (DM) is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production or insulin action. DM can cause serious complications and premature death, and is one of the leading causes of death and disability in the United States, especially among women of color. It has a major effect on the circulatory system and promotes the development of conditions such as arteriosclerosis and renal failure. The CDC reports that in 2007, 23.6 million people, or 7.8 % of the U.S. population, had diagnosed or undiagnosed diabetes. (3)

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The two main types of DM are type 1 and type 2. In type 1 diabetes, which affects 5 to 10 % of people with DM, the autoimmune destruction of pancreatic islet cells results in failure of insulin production leading to hyperglycemia. Type 2 diabetes affects 90 to 95 % of people with DM and has risk factors including older age, obesity, family history of DM, history of gestational diabetes, impaired glucose metabolism, physical inactivity, and race/ethnicity. People with type 2 diabetes are able to produce insulin, but do not metabolize glucose effectively, because they have insulin resistance or insufficient production of insulin. (3) Symptoms of DM include fatigue, polydipsia, frequent urination (especially at night), weight loss, blurred vision, frequent infections, and impaired wound healing. (4) Although type 2 diabetes was once most prevalent among older adults, its prevalence among children and adolescents is increasing. (5)

Any degree of glucose intolerance with onset or first recognition during pregnancy is called gestational diabetes mellitus (GDM) and is associated with an increased risk of fetal complications and development of type 2 diabetes by both mother and child. Approximately 5 to 10 % of women with GDM develop diabetes immediately following pregnancy, typically type 2. In addition, women with a history of GDM have a 40 to 60 % chance of developing DM in the subsequent 5 to 10 years. (3) Currently, GDM is diagnosed in about 7 % of pregnancies, (6) however, in March 2010, an international study group proposed updated criteria and universal screening, which could increase the incidence rate to 18 % of pregnancies. (7) (8)

Susceptibility and Impact

NEW DIAGNOSED CASES OF DIABETES

Over of 1.6 million new cases of DM were diagnosed in people ages 20 years or older in the U.S. in 2008. (9) The differential impact of this disease on morbidity and mortality across racial/ethnic groups, as exhibited in the table and figures which follow, is significant. Based on 2002–2003 data, new cases among youth were 19 per 100,000 per year for type 1 diabetes and 5.3 per 100,000 for type 2 diabetes. Non-Hispanic White youth had the highest rate of new cases of type 1 diabetes. While the rate of new cases of type 1 diabetes was higher than for type 2 diabetes among non-Hispanic White youth (10-19 years), the opposite was found among Asian/Pacific Islander and American Indian youth. African American and Hispanic youth had comparable rates of new cases of type 1 and type 2 diabetes. (3)

TOTAL DIAGNOSED CASES OF DIABETES

Data collected by the CDC National Health Interview Survey, presented in Table 3, delineate the age-adjusted percentages of persons 18 years of age and over with diabetes from 2004-2008. (10)

Table 3: Age-adjusted Percentages of Adults 18 years of age and over with DM by Race, United States, 2004-2008

Sex	American Indian or Alaska Native	White	Black or African American	Asian	Hispanic
Both Sexes	17.5	6.6	11.8	8.0	10.6
Females	16.2	6.2	12.1	7.1	10.7
Males	18.2	7.2	11.3	8.9	10.6

Adapted from CDC National Health Statistics Reports: Health Characteristics of the American Indian and Alaska Native Adult Population: United States, 2004-2008. Table 4. http://www.cdc.gov/nchs/data/nhsr/nhsr020.pdf. Date Accessed: July 28, 2010.

The category race refers to persons who indicated only a single race group. Persons who indicated a single race other than the groups shown are not shown separately due to small sample sizes. Persons who indicated not Hispanic or Latino and multiple races are excluded from the table. Persons of Hispanic or Latino origin may be of any race or combination of races. The category not Hispanic or Latino refers to all persons who are not of Hispanic or Latino origin, regardless of race. Respondents were asked if they had ever been told by a doctor or other health professional that they had these conditions. Female respondents were instructed to exclude pregnancy-related diabetes. Responses from persons who said they had borderline diabetes were treated as unknown with respect to diabetes.

NOTES: Estimates are age adjusted using the projected 2000 U.S. population as the standard population and using four age groups: 18–24 years, 25–44 years, 45–64 years, and 65 years and over. See Technical Notes for information regarding time frame for questions asking about conditions. Estimates are based on household interviews of a sample of the civilian, noninstitutionalized population.

National survey data from 2004 to 2008 for people 18 years or older indicate that 17.5 % of American Indian or Alaska Natives, 6.6 % of non-Hispanic Whites, 8.0 % of Asians, 10.6 % of Hispanics, and 11.8 % of non-Hispanic African Americans had diagnosed diabetes after adjusting for population age differences. Of the total female population over age 18, the prevalence of diagnosed diabetes was 16.2 % in American Indian or Alaska Native women, 12.1 % in non-Hispanic African American women, 7.1 % in Asian women, 10.7 % in Hispanic women, and 6.2 % in non-Hispanic White women, after adjusting for population age differences. (10)

Diabetes affects American Indian/Alaska Native populations disproportionally as compared to other racial/ethnic groups in the U.S., with an increasing prevalence and a predilection for youth. Data from the 2005 Indian Health Service user population database indicate that 14.2 % of the American Indians and Alaska Natives ages 20 years or older who received care from the Indian Health Service had diagnosed diabetes. Of the total adult population served by the Indian Health Service, 16.5 % had diagnosed diabetes after adjusting for population age differences, with rates varying by region from 6 % among Alaska Native adults to 29.3 % among American Indian adults in southern Arizona. (3)

The prevalence of DM has increased for all racial/ethnic populations in the United States since 1980, as shown in Figure 1. (11) In 2007, the age-adjusted prevalence of diagnosed diabetes was 8.0 % and 9.3 % among Hispanic and African American women, respectively, with older women much more likely to be diabetic. The age-adjusted prevalence rate among White women was 5.0 % with much less pronounced differences in prevalence rates by age group. In 2007, 12.7 % of African American women had diabetes, the highest diabetes prevalence rate among women, which surpassed Hispanic or Latina and White women, with respective rates of 10.9 and 6.1 %. Among Hispanics, rates were 9.5 %, 9.4%, and 4.6 % for Mexican/Mexican American, Puerto Rican, and Cuban women, respectively. (11)
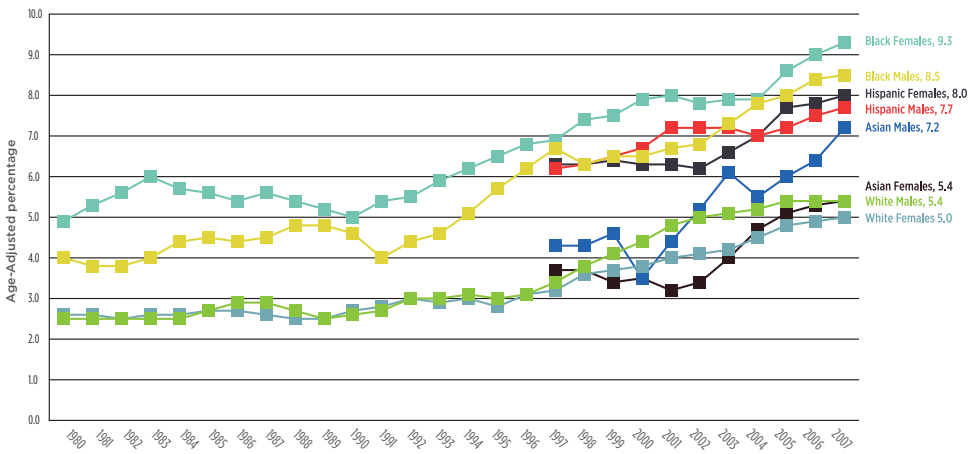
In 2002, diabetes prevalence among American Indian or Alaska Native women at least twenty years old was 15.9 %. The age-adjusted prevalence of diagnosed diabetes among American Indian/Alaska Native women increased by approximately 28 % between 1994 and 2002, compared to an approximately 58 % increase among all women in the United States over age twenty. (12) A 2003 study found that diabetes was more common among Zuni women than among other American Indian women and Zuni men. Twenty-four percent of Zuni females ages 20 and older had previously been told by a health professional that they were diabetic, while the rate of diabetes among Zuni men was much lower. (13) A 2004 survey of Asian Indian women ages 20 and older, living in Georgia, found that 13.6 % had diabetes and compared this finding to the rates of diabetes in other populations of women in the United States and Asian Indian immigrants in other countries. (14)

In a 2000 survey of Puerto Rican adults in New York City, 11.8 % of women reported having been diagnosed with diabetes, compared to 10.6 % of men. (15) A 1996–2000 survey of adults living in Puerto Rico found comparable rates. (16) A 2004 study of elderly Mexican American adults in southwestern states found that 22.6 % of the women had diabetes. (17) Comparable numbers of elderly Mexican American women living throughout the United States reported having diabetes. (11)

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GDM occurs more frequently among African American, Hispanic/Latino American, and American Indian women. (3) A 2002 survey of women in Colorado found the lowest prevalence GDM among non-Hispanic White women (3.1 %) and the highest among Asian women (6.8 %), with 5.4 and 5.5 % of Hispanic and African American women, respectively, reporting GDM. (18) In 2005-2007, more Native Hawaiian women reported having been told by a doctor that they had diabetes while they were pregnant (2.2 %) than any other racial/ethnic group in Hawaii. This compares to 2.0 % of Filipino, 1.6 % of Chinese, 1.3 % of Japanese, and 1.2 % of White women who responded to the survey. (19) GDM is also more common among obese women and women with a family history of diabetes (3)

DEATH RATES FROM DIABETES

In the United States, DM is among the leading causes of death for females and accounted for 3.0 % of deaths in women in 2006 (see Table 2). As can be seen in Table 2, DM was the fourth leading cause of death in 2006 among African American (5.0 %), American Indian/ Alaska Native (7.0 %), and Hispanic (5.4 %) women, the fifth leading cause of death among Asian/ Pacific Islander (3.8%) women, and the seventh among White women (2.7 %). (2) In addition, diabetes complications have a deleterious effect on the prognosis of cardiovascular disease. (3) In 2007, the mortality rates from diabetes among American Indian/Alaska Native and non-Hispanic African American women were higher than that of Asian/Pacific Islander and non-Hispanic White women—25.3 and 34.6 per 100,000 American Indian/Alaska Native women and non-Hispanic African American women, respectively, versus per 11.6 and 23.9 per 100,000 Asian/Pacific Islander and non-Hispanic White women, respectively. (20)

Figure 2: Age-Adjusted Diabetes Death Rates per 100,000 by Race, Sex, and Hispanic Origin, United States, 1980–2006 CDC
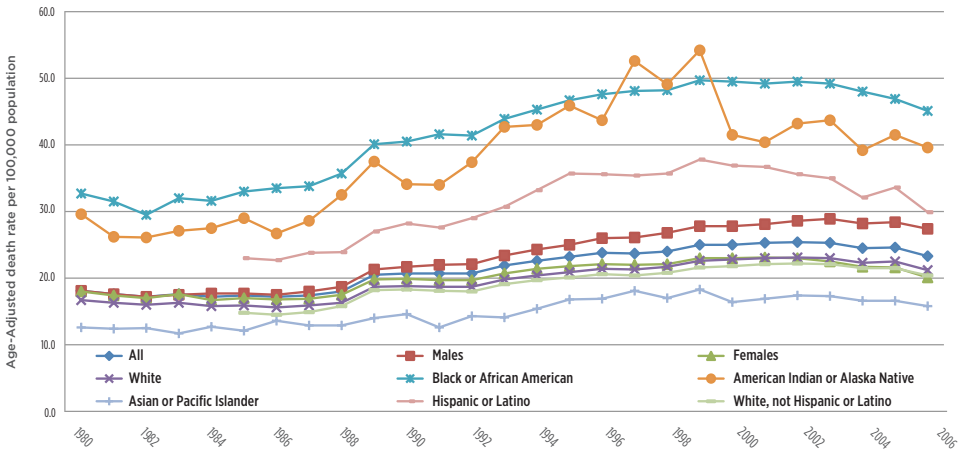
Adapted from CDC, 2009. Health United States, 2009. Table 26. http://www.cdc.gov/nchs/data/hus/hus09.pdf. Date Accessed: July 28, 2010.

Figure 2 shows the age-adjusted death rates per 100,000 people from DM by race, sex, and Hispanic origin between 1980 and 2006. According to CDC data, females, overall, are less likely than males to die from diabetes. White women have significantly lower diabetes mortality rates in comparison to African American and Hispanic or Latina women. Only Asian/Pacific Islanders have a lower death rate from DM than Whites. (21) As a result, diabetes must be understood as a chronic health disease that differentially affects women of color, specifically African American and Hispanic or Latina women and profoundly impacts the lives of individuals, families, and communities.

ASSOCIATED CONDITIONS AND OUTCOMES

Obesity and Overweight: Obesity and overweight are risk factors for DM. Analysis of data from the 2007-2008 National Health and Nutrition Examination Survey by the CDC indicates that in U.S. adults 20 years and older, an estimated 34.2% were overweight, 33.8% were obese, and 5.7% were extremely obese. (22) Overweight specifically refers to an excessive amount of body weight that may come from muscle, bone, adipose tissue, and water.

Obesity specifically refers to an excessive amount of adipose tissue. Body Mass Index (BMI) is a measure of body weight relative to height that is often used to identify if an individual is at a healthy weight, overweight, or obese and to characterize associated risks (23). In 2007-2008, among women age 20 and older, the age-adjusted prevalence of obesity (BMI > 30) was higher among non-Hispanic Black (49.6 %) and Mexican-American women (45.1 %) women than among non-Hispanic White (33 %) women. (22)

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Cardiovascular disease and hypertension: Adults with diabetes have heart disease death rates approximately two to four times higher than adults without diabetes and the risk for stroke is two to four times higher among people with diabetes. In 2004, heart disease and stroke were noted on 68 % and 16 % of diabetes-related death certificates among people aged 65 years or older, respectively. In 2003-2004, approximately 75 % of adults with diabetes also had high blood pressure or used anti-hypertensive medications. (3)

Blindness: Diabetic retinopathy is one of the leading causes of blindness in the United States and occurs when the retina is damaged due to aneurysms, hemorrhages, and retinal vascular abnormalities due to diabetes. Diabetic retinopathy causes 12,000 to 24,000 new cases of blindness each year. (3) A 2004 study of the prevalence of diabetic retinopathy among adults over age 40 in the U.S. indicated that White women with diabetes had a higher prevalence of any level of retinopathy than African American and Hispanic women. However, African American women with diabetes had the highest prevalence of vision-threatening retinopathy (10 %), compared to White (8.1%) and Hispanic (7.7 %) women ages 40 and older. (24)

Renal disease: Diabetes is the leading cause of renal failure in U.S. In 2005, it accounted for 44 % of new cases. In that year, 46,739 people with diabetes began treatment for end-stage renal disease and a total of 178,689 people with end-stage renal disease due to diabetes were living on chronic dialysis or with a renal transplant in the United States and Puerto Rico. (3)

Neuropathy/Vasculopathy and Amputation: The majority of people with DM have mild to severe forms of nervous system damage, (25) and more than 60 % of nontraumatic lower-limb amputations occur in people with DM – approximately 71,000 in 2004. (3) A national study looking at the incidence of lower extremity amputation in Americans with DM, reported that more amputations occurred among African Americans than Whites, but the difference was statistically significant only for those who developed DM over the course of the study (3.4 % vs. 1.4 %). Further, the effect of race diminished after adjusting for education, hypertension, and smoking. (26) Data from The Strong Heart Study, a study of cardiovascular disease and its risk factors in 13 American Indian communities, found that risk for lower extremity amputation for Native American men with DM was over twice that of Native American women with DM. (27)

Overall, the health outcomes of African Americans (both women and men) with DM are far worse than those of Whites; blindness, (24) amputation, (26) end-stage renal disease, (28) and death related to DM complications (21) disproportionately affect African Americans. In a 2002 study of insured people with DM in northern California, African American women were found to have higher incidence of stroke, congestive heart failure, and end-stage kidney disease than White, Asian, and Latino women with DM. However, White women had the highest incidence of myocardial infarction and lower extremity amputation among the women studied. (28)

COST OF DIABETES

The total estimated cost of diagnosed diabetes in the United States in 2007 was over $174 billion, approximately $116 billion for direct medical costs and $58 billion for indirect costs for example, disability, work loss, premature mortality. After adjusting for age and sex differences, the average annual medical expenditures were 2.3 times higher for people with diagnosed diabetes. Factoring in the additional costs of undiagnosed diabetes, pre-diabetes, and gestational diabetes accounts for an estimated total cost of diabetes in the United States in 2007 of $218 billion: $18 billion for the 6.3 million people with undiagnosed diabetes, $25 billion for the 57 million American adults with pre-diabetes and $623 million for the 180,000 pregnancies during which gestational diabetes is diagnosed. (29)

Conclusion

The research findings highlighted in this publication draw attention to the influence of sex, gender, cultural, and racial and ethnic differences in the epidemiology, diagnosis, prognosis, and outcomes of diabetes mellitus. These data provide the research basis for developing therapeutic strategies and approaches to improve care for all racial and ethnic groups including women of color, an extremely heterogeneous group in and of itself. It is important to keep these health differences between and among populations of women and men in mind when treating women of color who have been diagnosed with or are at risk for DM.

The challenge becomes to refine the knowledge base and understanding such that individualized care can be provided to each and every woman of color, regardless of race or ethnicity and health status. It is essential that the training of health care professionals and the development of clinical practice standards take into consideration the role of race and ethnicity, socioeconomic background, geographic location, and other factors which affect health.

Scientific knowledge about human health and disease is enriched with the inclusion of a diverse population of participants in clinical studies. Collaboration between clinicians, public health practitioners, the community, and clinical research teams is vital to the success of research that addresses DM in women of color. It is through research that incorporates factors such as sex/gender and race/ethnicity in the study design, conduct, and analysis, that the body of knowledge can be expanded and evidence-based health care for DM can be delivered to all women of color. Resources for information on clinical research include:

- ClinicalTrials.gov (http://clinicaltrials.gov/)
- ORWH Outreach Publications for the Inclusion, Recruitment and Retention of Women and Minority Subjects in Clinical Research (http://orwh.od.nih.gov/inclusion/incloutreach.html)

Research Highlights

This section summarizes a few examples of NIH-supported research on DM and highlights the importance of research in advancing scientific knowledge and expanding understanding of the etiology and prognosis of diseases such as DM.

The Diabetes Prevention Program

Both lifestyle and oral hypoglycemic agents can reduce the development of type 2 diabetes in high risk groups. The Diabetes Prevention Program (DPP) was a major multicenter controlled clinical trial that examined the efficacy of an intensive life-style intervention or treatment with the oral diabetes drug metformin in the prevention or delay of onset of type 2 diabetes in a high risk population. At the beginning of this clinical trial, all participants were overweight and had blood glucose levels higher than normal but not high enough for a diagnosis of DM—a condition called pre-diabetes. Sixty eight percent of the 3234 participants were women and 45 % were from minority groups: African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, or Pacific Islander. This is the largest high risk population including minorities ever studied. (30)

There was a statistically and clinically significant reduction in the development of DM in both the life-style intervention group (participants who lost a modest amount of weight through dietary changes and increased physical activity) and the metformin–treated group, with reductions in risk of developing type 2 diabetes of 58 % and 31 %, respectively. The DPP resolved its research questions earlier than projected, and following the recommendation of an external monitoring board, the study was halted a year early. (31)

The DPP cohort has been followed in the DPP Outcomes Study (DPPOS). Maintaining its 68 % participation of women, the DPPOS is the largest study population with pre-diabetes and the only population with type 2 diabetes studied from time of onset. The study cohort will provide insights regarding the clinical course of these metabolic disorders and will provide information on the persistence of the prevention or delay of type 2 diabetes and event rates for microvascular and macrovascular disease. In addition, the DPP followed by the DPPOS is the longest follow-up study of sustained weight loss ever conducted. Of major interest is the outcome of continued lifestyle change and long term weight loss, and metformin intervention in the female and minority subgroups during the DPPOS. (32)

During the DPP-DPPOS 10 year outcomes study, the treatment groups had similar diabetes incidence rates, but the reduction in cumulative incidence from DPP interventions persisted. Other risk factor changes suggested intervention benefits beyond simply reducing glycemia. (32)

United States-Mexico Border Diabetes Prevention and Control Project

The major goal of the United States-Mexico Border Diabetes Prevention and Control Project is to prevent diabetes complications by controlling diabetes among people who have type 2 diabetes in the United States-Mexico border region. The project developed and implemented strategies in collaboration with the 10 U.S.-Mexico Border States, the Pan American Health Organization (PAHO), and various federal, state, academic, and nonprofit organizations with an interest in diabetes prevention and control. (33)

This is a border wide collaborative research effort between two neighboring nations extending 60 miles on each side of the 2,040 mile international boundary between the United States and Mexico. It includes the southern portions of four U.S. states (Arizona, California, New Mexico, and Texas) and the northern portions of six Mexican states. This project is comprised of a cross-sectional study of the prevalence of diabetes, prediabetes, overweight in adults, and preventive health practices. This two-phase collaborative project includes a survey of diabetes prevalence and risk factors, as well as training for community health workers (CHWs) and health care providers. Training is being implemented in seven strategically selected sites along the border, in English or Spanish as preferred by the health care providers and CHWs, to enhance DM awareness and treatment throughout the community. (34)

Through this project over 1.11 million inhabitants of the bi-national border region have been diagnosed with diabetes. Over 40 % of the adults in the Mexico Border States and 11.6 % of Hispanic/Latino adults in the U.S. Border States were not aware that they had diabetes. The prevalence of overweight and obesity was lower among adults with diabetes in Mexico at 27 % than in the United States at 54.5 %. (34) In the border area, 35.6 % of women were overweight, and 34.4 % of women were obese. (35)

Poverty and Diabetes

A 2005 study has shown that type 2 diabetes and socioeconomic status exhibit an inverse relationship in Hispanic, non-Hispanic African American, and non-Hispanic White women, although the same is less true for men. For women of all three groups, as the number of years of education and the Poverty Income Ratio (PIR) rise, the likelihood of developing type 2 diabetes decreases. The PIR is computed by dividing family income by the federal poverty level. (36) Another study, however, found that among White (but not African American) women, increased educational attainment was associated with lesser risk of developing DM. (37)

Researchers examined the associations of PIR, education, and occupational status with type 2 diabetes prevalence among African American and non-Hispanic White women and men aged 40 to 74 years. They analyzed cross-sectional data from the Third National Health and Nutrition Examination Survey, controlling for age and examination-related variables. Among African American women, there was a strong, graded association between PIR and diabetes, which remained significant after adjusting for other risk factors. All 3 variables were significantly associated with DM among non-Hispanic White women, but only PIR was significantly associated with diabetes in non-Hispanic White men. There were no significant associations for African American men. From this analysis, it appears that socioeconomic status is associated with type 2 diabetes prevalence among women, but not consistently among men. Diabetes prevalence was more strongly associated with PIR than with education or occupational status. These associations were largely independent of other risk factors, especially among African American women. These data suggests that economic resources should be addressed in efforts to explain and reverse the increasing prevalence of DM in the United States. (37)

Diabetes in Pima Indians

Half of adult Pima Indians living in Arizona have diabetes and 95 % of those with DM are overweight. For the past 30 years, the Pima Indians have worked with investigators at the NIH National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) to understand the genetic, environmental, and lifestyle factors at the root of the DM epidemic in their community. These longitudinal studies, which have allowed researchers to look at individuals over a long period of time and also multiple generations of families, have helped to prove that obesity is a major risk factor for the development of diabetes. For instance, these studies have

shown that before gaining weight, overweight people have a slower metabolic rate compared to people of the same weight. Further, since some of the children born within this community after the study began are now 28 to 30 years old, researchers are able to understand how a mother's DM can influence a child's health in adulthood. (38)

One theory for the prevalence of DM observed in the Pima community is based on the concept of a "thrifty gene," proposed in 1962 by geneticist James Neel. This theory posits that populations, such as the Pimas, who traditionally experienced periods of feast and famine due to a reliance on hunting for food, may have developed a genetic mutation which allowed them to store fat during times of plenty so that they would not starve during times of famine. Since these populations have adopted the typical Western lifestyle, with less physical activity, a high fat diet, and access to a constant supply of calories, this gene may now work against them, continuing to store calories in the form of unhealthy amounts of fat. (39) In fact, NIDDK researchers recently visited a Pima community living as their ancestors did in a remote area of the Sierra Madre mountains of Mexico. While the thirty-five Mexican Pimas that were studied were genetically similar to the Arizona Pimas, only three had diabetes, and the population as a whole was not overweight, emphasizing the importance of lifestyle and diet in preventing the onset of DM. (38)

The Weight-Control Information Network

The Weight-control Information Network (WIN) is a national information service of the NIDDK. WIN provides the general public, health professionals, the media, and Congress with up-to-date, science-based information on weight control, obesity, physical activity, and related nutritional issues.

Sisters Together: Move More, Eat Better is a national initiative of the WIN, designed by NIDDK to encourage African American women ages 18 and over to maintain a healthy weight by becoming more physically active and eating healthier foods. Sisters Together works with national and local newspapers, magazines, radio stations, schools, and consumer and professional organizations to raise awareness among African American women about the health benefits of regular physical activity and healthy eating. This effort is timely since recent statistics indicate that nearly 80 % of African American women are overweight or obese.

Sisters Together offers three age-appropriate and culturally relevant brochures that give African American women, and their families and friends, practical, science-based tips to help them move more, eat better, and ultimately, improve their quality of life. (40)

For more information or to obtain materials, contact the NIDDK at:
Toll free: 1-877-946-4627 Fax: (202) 828-1028 E-mail: win@info.niddk.nih.gov
Weight-control Information Network, 1 WIN Way, Bethesda, MD 20892-3665

ADDITIONAL INFORMATION

Additional information on DM and the health of women and minorities can be found at:

- The National Institute of Diabetes and Digestive and Kidney Diseases (http://www2.niddk.nih.gov/)

- The National Diabetes Information Clearinghouse (http://diabetes.niddk.nih.gov/)

- The National Institute on Minority Health and Health Disparities (http://ncmhd.nih.gov/)

- The Office of Research on Women's Health (http://orwh.od.nih.gov/)

- Women's Health Resources (http://womenshealthresources.nlm.nih.gov)

- The CDC Diabetes Public Health Resource (http://www.cdc.gov/diabetes/)

- The HHS Office of Women's Health - Diabetes (http://www.womenshealth.gov/illness-disability/types-illness-disability/diabetes.cfm)

- The HHS Office of Minority Health – Diabetes Section (http://minorityhealth.hhs.gov/templates/browse.aspx?lvl=2&lvlID=21)

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