

Family history and diabetes among adult participants of the National Health and Nutrition Examination Survey, 1999-2002.

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Introduction

Study purposes:

- Assess the feasibility of utilizing genomic information from an existing, national population-based data source.
- Examine the strength and effect of having a family history of diabetes in first-degree relatives on the prevalence of diabetes among U.S. adults.

An estimated 18.2 million individuals in the U.S. are affected with diabetes.¹ Type 2 diabetes, which represents 90-95% of total diabetes, is especially concerning because of its *increasing prevalence* over the past several years.^{1,2,3} In addition, the disease may *progress undetected* for years. Undiagnosed diabetes constitutes almost 1/3 of total diabetes prevalence.²

Risk factors for type 2 diabetes:

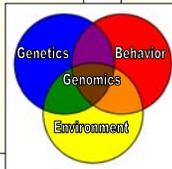
- ◆ Age ≥ 45 years
- ◆ Race/ethnicity (i.e., African American, Hispanic American, and Native American)
- ◆ Overweight or obesity
- ◆ Physical inactivity
- ◆ **Family history of diabetes**

Identifying high-risk individuals and those in the pre-symptomatic stage of diabetes can be crucial for the prevention, early detection, and treatment of type 2 diabetes.

Family history of diabetes is currently recognized as an important risk factor and screening criterion for type 2 diabetes.⁴

The etiologies of type 2 diabetes are multiple and complex.

Family history of diabetes provides valuable **genomic** information because it represents the combination of inherited genetic susceptibilities and shared environmental and behavioral factors.⁵



Methods

The National Health and Nutrition Examination Survey (NHANES) is a population-based survey conducted annually by the National Center for Health Statistics. Information is collected via in-home interviews and physical examinations. Public-use data files are available on-line at: www.cdc.gov/nchs/nhanes.htm.

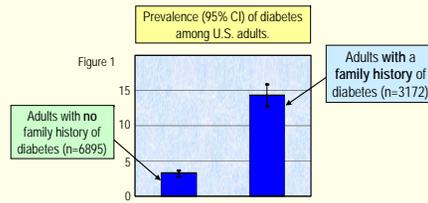
This study utilized data from **10283 adults** who participated in NHANES during 1999-2002. Prevalence estimates and 95% confidence intervals (CI), stratified by demographics and risk factors, were calculated. Analyses incorporated appropriate NHANES sample weights to account for complex sampling design.

Subjects were categorized by:

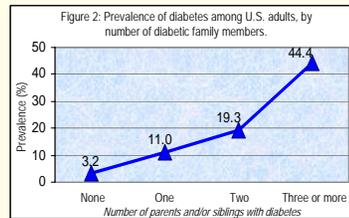
- **Gender** – male, female
- **Age group** – age at time of interview; 20-39, 40-59, 60+ years
- **Race/ethnicity** – non-Hispanic white, non-Hispanic black, Mexican American, other
- **Body mass index** – measured during examination; BMI < 25, BMI 25-29, BMI ≥ 30
- **Diabetes status** – self-report of a previous diagnosis of diabetes (other than during pregnancy); discrimination between type 1 and type 2 diabetes was not done
- **Age of diagnosis** – self-reported by subjects with diabetes
- **Family history** – self-report of a diabetic parent and/or sibling (living or deceased); not ascertained from 216 individuals

Results

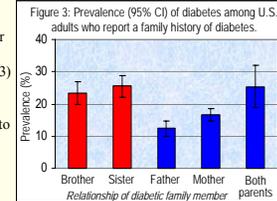
The diabetes prevalence for adults with a **family history** of diabetes was almost **4 1/2 times higher** than the prevalence for those without a family history. (Figure 1)



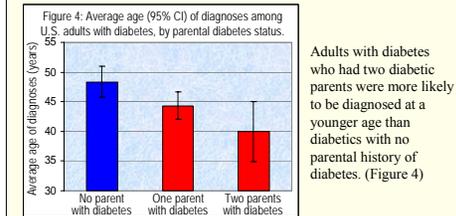
Diabetes prevalence increased significantly with corresponding increase in number of family members affected with diabetes ($p < .001$). (Figure 2) The proportion of adults with diabetes among subjects who had three or more diabetic relatives (44.4%) was higher than the prevalence associated with any other factor measured.



The diabetes prevalence increased with the number of parents affected with diabetes ($p < .001$). (Figure 3) Having a sibling with diabetes conferred a diabetes risk comparable to having two diabetic parents.



Adults with diabetes who had two diabetic parents were more likely to be diagnosed at a younger age than diabetes with no parental history of diabetes. (Figure 4)

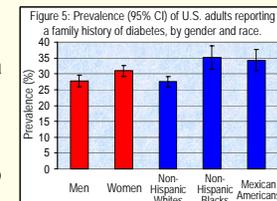


Consistent with the literature, this study found diabetes prevalence among adults increased significantly with age ($p < .001$) and BMI ($p < .001$). And among the gender-race groups, non-Hispanic black women had the highest diabetes prevalence (11.4%), followed by non-Hispanic black men (8.2%).

Several significant differences in family history reporting were evident in this study.

- ◆ **65.1%** of adults with diabetes reported having a family history of the disease, as compared to only **27.0%** of those without diabetes ($p < .001$).
- ◆ **37.5%** of obese (BMI ≥ 30) adults, and **30.0%** of overweight (BMI 25-29) adults reported a family history of diabetes, as compared to **22.6%** of healthy-weight (BMI < 25) adults ($p < .001$ for both).

- ◆ Additionally, a family history of diabetes was more likely to be reported by women than men ($p = .006$), and by non-Hispanic blacks and Mexican Americans than non-Hispanic whites ($p = .001$, $p < .001$). (Figure 5)



Discussion

Family history of diabetes was found to be a significant predictor of diabetes prevalence in the adult U.S. population. Factors that may influence this association include:

- ◆ Diabetes has strong genetic components, and its heritability has been previously supported.⁶
- ◆ Compared to those without a family history, individuals who have close relatives with diabetes may be more motivated to seek early health screening; thus, diagnoses may be more likely, and age of onset younger for these persons.
- ◆ Individuals who have diabetes may be more likely to collect family health history information, as compared to those without diabetes.

Implications:

- Family health history is easily available and inexpensive to obtain, yet may be under-utilized in health care practice.⁵ This study's findings suggest family history to be a valuable source of genomic information and measure of disease risk, and thus, support the application of a family history tool for diabetes prevention and early detection strategies.
- Diabetes has paralleled the obesity epidemic, both of which have strong modifiable risk factors. Since the presence of family history often reflects shared health-related behaviors among family members, the recognition of this high correlation between obesity, diabetes, and family history can help guide population-appropriate health promotion activities.
- This project represents a feasible and inexpensive method of extracting genomic information from existing population-based data sources. Because family history encompasses genetic, behavioral, and environmental factors, it can be applied to other chronic diseases and can be translated into other public health program areas.

Limitations:

- Unable to discriminate between type 1 and type 2 diabetes.
- Diabetes, age of onset, and family history are self-reported, creating a potential for recall bias or misclassification.
- NHANES excludes institutionalized persons, such as residents of nursing homes who are likely to be older adults.

References

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