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Socio-economic status and undiagnosed diabetes

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Abstract

Objective: To test the association of undiagnosed Type 2 diabetes mellitus with education and income level.
Methods: We utilized measures of diabetes status, fasting plasma glucose, socio-economic status, and demographic characteristics from the National Health and Nutrition Examination Survey (NHANES III) for adults of age 20 and older. We inferred the presence of undiagnosed diabetes using the criterion of the American Diabetes Association at the time of NHANES III. A logistic regression analysis was used to examine the association of undiagnosed diabetes with education and income after controlling for other variables.
Results: Undiagnosed diabetes is not related to education or income. In the sub-population of individuals with diagnosed or undiagnosed diabetes, undiagnosed diabetes is more likely in obese individuals (OR 1.95, 1.01–3.76), but is not related to education or income.
Conclusions: Socio-economic status, as measured by education and income, is not associated with whether or not individuals are likely to have undiagnosed diabetes. This finding suggests that screening for Type 2 diabetes should focus on those adults who are at risk for diabetes in general (based on age, racial/ethnic groups, obesity and other clinical risk factors) and that socio-economic characteristics are unlikely to provide further information.
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1. Introduction

The most recent estimate of the prevalence of Type 2 diabetes (diagnosed and undiagnosed) in American adults is over 8% for those aged 20 or older and approximately 20% in adults aged 65 or older [1]. It is apparent that this prevalence has been increasing over time [1,2]. A large fraction of adults with Type 2 diabetes, on the order of one-third of the total, are undiagnosed and therefore untreated [2,3]. The size of the undiagnosed fraction of adults with diabetes is a major public health concern, heightened by the evidence that the latent stage is likely to be long, and that diabetes-related complications may develop and

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progress prior to the time of diagnosis [4]. Earlier detection and treatment of Type 2 diabetes may reduce the development of complications in those presently undiagnosed [5].

It has been reported that there is a high prevalence of clinical characteristics in those who have been diagnosed with Type 2 diabetes. These include obesity, sedentary lifestyle, positive family history, dyslipidemia, and hypertension [6], and are identified as risk factors for the development of this disease. Additionally, there are higher rates of diabetes among those of older age, lower socio-economic status, and in African–American and Hispanic persons [2,7]. Screening recommendations have been put forth in an attempt to identify asymptomatic individuals who are likely to have diabetes, and suggest screening based on age, body mass index, and the presence of hypertension and dyslipidemia [8]. However, compared to clinical risk factors, much less is known about the socio-economic and demographic characteristics of those with undiagnosed Type 2 diabetes. A greater understanding of the non-clinical characteristics of those most likely to be undiagnosed could have implications for the targeting of screening programs.

The health economics literature suggests that information, for example knowing whether one has diabetes, has potential health benefits, but acquiring this information requires the use of resources. In the present context, the information that may be obtained is knowing whether or not one has diabetes *when in fact one actually has the condition but is currently undiagnosed*. Our hypothesis, based on prior studies in the economics literature, is that certain persons are more efficient acquirers of information than others. The characteristics of persons who are hypothesized to be efficient producers of information are those with greater educational attainment and socio-economic status [9–11]. Efficiency in the production of information can be characterized in terms of the use of resources, such as doctor visits, to obtain a correct diagnosis. In addition, production of information may lead to a greater awareness of risk factors that prompt a doctor visit.

The purpose of this paper is to test the hypothesis that the risk of undiagnosed Type 2 diabetes is related to factors which are associated with efficiency in the production of information, including education and income, after adjusting for risk factors such as gender, age, ethnic group and body mass index.

2. Research design and methods

We used cross-sectional data from the Third National Health and Nutrition Examination Survey, 1988–1994 (NHANES III). NHANES III is a national population-based health survey conducted between 1988 and 1994 that includes personal interviews of medical history, medical examination, and laboratory analyses reporting fasting blood glucose levels and HBA1c values [2]. In our analyses, we focus on the sub-sample of those who meet diagnostic criteria for diabetes based on fasting blood glucose results, as well as subjects who indicated that they had been previously diagnosed with diabetes.

We defined 'diagnosed' diabetes based on the self-reported response to the medical interview question, 'Have you ever been told by a doctor that you have diabetes or sugar diabetes?' As our focus is on adult persons with Type 2 diabetes, we restricted the sample to adults of age 20 and older. We also omitted those individuals who are likely to have Type 1 diabetes, which was inferred based on age of onset less than 30 years, who are lean (body mass index below 27.2 for males and 26.9 for females), and who use insulin [12]. We defined 'undiagnosed' Type 2 diabetes by applying the criterion of the American Diabetes Association in effect at the time of NHANES III data collection, which diagnosed the presence of diabetes if the fasting blood glucose level was greater than or equal to 140 mg/dl [13]. This criterion was amended by the ADA in 1997 after the end of the sampling period of NHANES III [14].

To test our hypotheses we used a statistical regression equation. In our regression equation, the dependent variable was whether or not the respondent had undiagnosed (rather than diagnosed) diabetes, based on the criteria specified above. In this analysis, we included all persons whose record included a value for fasting plasma glucose. Independent variables, identified in Table 1, were based on those found in previously reported studies of diagnosed diabetes [2,7]. Household income is measured by the poverty–income ratio, the ratio of household income to the federal definition of the poverty level of income, which varies by year and by the size of the household. Education is measured by a set of categorical variables, with 0–8 years of education as the reference category. Obesity is inferred if the individual's body mass index exceeds 30 kg/m^2.

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