Explaining variations in reported diabetes prevalence in general practice: how much variation is explained by differences between practice populations?

Elizabeth Goyder and Vicky Hammersley

SUMMARY

There are large variations in reported diabetes prevalence within United Kingdom (UK) populations. Linear regression was used to investigate whether population characteristics could explain the variation in prevalence between 19 practices with relatively complete diagnostic recording. Population obesity and South Asian ethnicity largely explained observed variation in prevalence (adjusted R^2 = 0.80). When adjusted for obesity and ethnicity, the deprivation score was no longer a predictor of diabetes prevalence. If true variation in prevalence between practices is largely predicted by population ethnicity and obesity, these population characteristics could be used to predict expected prevalence and to assess the completeness of practice registers.

Keywords*: diabetes mellitus; prevalence; obesity; ethnicity.*

E Goyder, MD, MFPH, clinical senior lecturer in public health, ScHARR (School of Health and Related Research), University of Sheffield. V Hammersley, BSc, research network co-ordinator, Trent Focus Collaborative Research Network, Division of General Practice, University of Nottingham.

Address for correspondence

Dr Elizabeth Goyder, ScHARR, University of Sheffield, Regent Court, 30 Regent St, Sheffield S1 4DA.
E-mail: e.goyder@sheffield.ac.uk

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Introduction

PREVIOUS studies have highlighted the wide variations in diabetes prevalence at practice level,[1,2] and prevalence is known to be associated with deprivation[2] and ethnicity.[3] The aim of this study was to investigate how much variation in prevalence might be explained by underlying differences in the risk of diabetes in the practice population, rather than by variation in diagnosis or recording of cases.

Method

Data was collected from 19 practices using EMIS clinical information systems out of 26 Trent Focus Collaborative Research Network (CRN) volunteer practices. Information was collected on all registered patients, including age, sex, body mass index (BMI), and any diabetes-related clinical or prescription codes, including both drugs and diabetes monitoring equipment. The Townsend score and population ethnicity was identified for each of the 19 practice wards using MIMAS.[4]

Potential explanatory variables considered were: ward Townsend score, proportion of the ward population who were identified as black in the 1991 Census (including black African and black Caribbean), proportion of the ward population who were identified as South Asian in the 1991 Census (including Indian, Pakistani and Bangladeshi), and the proportion of the practice population with a recorded BMI greater than 30.

Scatter plots of age-adjusted prevalence against each explanatory variable and linear regression (using SPSS for Windows version 10.0) were used to establish the association between explanatory variables and the prevalence of diagnosed diabetes at general practice level. A residuals analysis was performed to check the regression assumptions.

Results

The prevalence of diabetes and associated population characteristics varied widely between practices (Table 1). In univariate analyses, ethnicity and deprivation at ward level were significant predictors of prevalence. After excluding an outlier practice with 35% of its ward population from black and South Asian ethnic groups, population obesity was also a predictor of diabetes prevalence in univariate analysis (B = 0.077, 95% confidence interval [CI] = 0.040 to 0.114, adjusted R^2 = 0.52, P<0.001). In a multiple linear regression based on all 19 practices, and including all the variables that were considered potential predictors of diabetes prevalence, only the proportion of the population of South Asian

HOW THIS FITS IN

What do we know?

The reported prevalence of diabetes at general practice level varies widely between practices. It is uncertain how much of this variation reflects true differences in prevalence and how much reflects differences in diagnosis or case ascertainment.

What does this paper add?

The variations in prevalence between practices in this study reflect real differences in the underlying prevalence of diabetes that can be predicted by the age and ethnicity of populations and the prevalence of obesity. Practice-level information on ethnicity and BMI can be used to estimate the expected prevalence of diabetes and assess the relative completeness of registers.

origin and the proportion of the practice population with a BMI greater than 30 remained statistically significant independent predictors of prevalence. A linear regression model that included only these two variables predicted 80% of the observed variation across 19 practices (Table 2).

Discussion

For the study practices, the overall prevalence of diabetes is predicted by the proportion of recorded BMIs over 30 and the proportion of the practice ward population of South Asian ethnicity. These analyses suggest that the wide variation in reported diabetes prevalence at general practice level found by previous studies may be owing to real differences in the underlying prevalence of disease between practices as well as differences in the proportion of cases diagnosed, or accuracy and completeness of recording.

The major strength of this study was the availability of practice level data from practices with relatively complete recording of both BMI and diabetes. Trent Focus CRN practices are known to have populations representative of the population of Trent.[5] Recruited practices might have greater interest in diabetes and more complete data recording,[6] but it is unlikely that the relationship between prevalence and population characteristics would be systematically different.

A major limitation is that the study only included 19 practices. Only two of the practices were situated in wards with more than 10% of their population from ethnic minorities. Ten of the practices were situated in wards with less than 1% of their population from ethnic minorities. This means that the association between ethnicity and prevalence is heavily influenced by a minority of practices, particularly the single practice identified as an outlier in the plot of prevalence against obesity. Moreover, South Asian and African/Caribbean populations were closely correlated for our practices (Spearman's rho = 0.75, $P<0.001$) and so we cannot generalise our findings related to the relationship between specific ethnic groups and prevalence at practice level.

Another important limitation in explaining differences in diabetes prevalence between study practices is that the main determinants of prevalence identified here (obesity and ethnicity) in practice populations are either not generally recorded at all (ethnicity) or are incompletely recorded (obesity). More complete practice-level data on these variables would allow for more a confident prediction of expected diabetes prevalence at practice level.

In our study practices, most of the variation in reported prevalence was explained by differences in patient characteristics. Remaining variation that cannot be explained by patient characteristics could be owing to a combination of random variation, preferential registration (if people with diabetes are more likely to register with a GP with a special interest in diabetes) and to differences in screening and diagnostic practice between practices. This study suggests that, if practice recording is relatively complete, as in these 19 practices, most variation between practices in diabetes prevalence is likely to be explained by variations in ethnicity and obesity rates.

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Table 1. Population characteristics and diabetes prevalence in 19 study practices.

Population characteristics	Median	Range
List size	6845	2494 to 14 636
Aged 45 to 64 years (%)	24.1	17.9 to 52.7
Aged over 65 years (%)	14.6	12.1 to 21.2
White[a] (%)	99.1	65.0 to 99.9
South Asian[a] (%)	0.2	0.0 to 14.4
African/Caribbean[a] (%)	0.3	0.0 to 17.3
Townsend score[a]	0.24	-4.32 to 10.55
BMI recorded (%)	61.5	38.0 to 80.1
Obese (BMI >30)[b] (%)	16.7	12.2 to 25.2
Overweight (BMI 25 to 30)[b] (%)	34.3	28.8 to 39.6
Diabetes prevalence (%)		
Treated by insulin	0.75	0.40 to 0.96
Treated by oral hypoglycaemics	1.28	0.81 to 2.06
All diabetes treated by drugs	2.03	1.21 to 2.98
All diabetes (treated by drugs and controlled by diet)	2.61	1.76 to 4.09
All diabetes age-standardised (to European Standard Population)	2.27	1.32 to 4.14

[a]Based on practice ward. [b]Based on all patients with a recorded BMI.

Table 2. Associations between population characteristics and age-standardised diabetes prevalence (%) for 19 practices.

Explanatory variable	B (95% CI)	*P*-value	Adjusted R^2
Univariate linear regression			
Townsend score[a]	0.099 (0.039 to 0.159)	0.003	0.38
South Asian[a] (%)	0.141 (0.084 to 0.198)	<0.001	0.60
African/Caribbean[a] (%)	0.085 (0.030 to 0.141)	0.004	0.35
Obese (BMI>30)[b] (%)	0.051 (-0.028 to 0.130)	0.2	0.05
Multivariate linear regression			
South Asian,[a] adjusted for % obese (%)	0.154 (0.113 to 0.195)	<0.001	
Obese (BMI >30),[b] adjusted for % South Asian (%)	0.074 (0.037 to 0.111)	0.001	0.80

[a]Based on practice ward. [b]Based on all patients with a recorded BMI.

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