

A comparison, for older people with diabetes, of health and health care utilisation in two different health systems on the island of Ireland

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Abstract

Background Primary care policies for diabetes have differed between Northern Ireland (NI) and the Republic of Ireland (ROI). In NI, the Quality and Outcomes Framework (QOF) system was adopted in 2004. In ROI, prior to the Cycle of Care programme being established in 2015 specific financial support for GPs providing diabetic primary care was not available. The aims of this study are to compare health and healthcare utilisation among people with diabetes in the NI and ROI.

Methods Large scale comparable surveys of people over 50 years of age in Northern Ireland (NICOLA) and the Republic of Ireland (TILDA) are used to compare people with diabetes (Type I and Type II) in the two jurisdictions. The combined data set comprises 1,536 people with diabetes. A coarsened exact matching approach is used to compare health care utilisation among people with diabetes in NI and ROI with equivalent demographic, lifestyle and illness characteristics.

Results The overall prevalence in the 50 to 84 years old age group is 3.4 percentage points higher in NI (11.1% in NI, 7.7% ROI, p-value < 0.01). The diabetic population in NI also appear sicker – with more diabetic complications and more chronic illnesses. Comparing people with diabetes in the two jurisdictions with similar levels of illness we find that there are no statistically significant differences in GP, outpatient or A&E utilisation.

Conclusion There are a range of factors that influence the quality of primary care for people with diabetes. While the QOF system in Northern Ireland is likely to have improved some aspects of care by providing financial incentives for identification and management, unless accompanied by improved access to care their ability to impact on outcomes may be compromised.

1. Introduction

In Northern Ireland (NI), based on registry data, 5.6% of the population aged 18 and over are registered with diabetes (1). While in the Republic of Ireland (ROI) a similar register does not exist, it has been estimated that 5.2 per cent of those aged 18 and over have diabetes (2). Diabetic care is a substantial driver of overall health care utilisation and costs. In Europe and North America, the proportion of healthcare expenditure on diabetes in 2010 ranges from 6 to 14 per cent (3). An earlier study estimated the cost of Type II diabetes in ROI to be 6.4 per cent of the total healthcare budget (4). In addition to direct healthcare costs, diabetes significantly impacts on mortality rates, quality of life and labour market productivity (5, 6).

Healthcare utilisation and healthcare costs among those with diabetes are strongly related to diabetic complications; in the UK, 80 per cent of diabetic healthcare costs are due to complications (7, 8). The direct healthcare cost of complications in the UK include: cardiovascular diseases related to diabetes (36% of the overall healthcare cost) and foot ulcers and amputations (13%) (7). Predictive factors for the development of complications include duration of diabetes and glycaemic control (9, 10).

The risk of diabetic complications can be reduced by self-management of the disease as well as appropriate management by healthcare practitioners. In the 2016 Scottish Diabetes Survey, 45 per cent of patients had a HbA1c of more than 58 mmol/mol (7.5% DCCT), suggesting substantial scope for improved glycaemic control and management of diabetic care. A combination of diet, exercise and medication are typically advised for people with diabetes to achieve good glycaemic control. In addition to accessibility to quality health care, social, cultural and economic factors play an important role in an individual's capacity to manage their diabetes (11). Factors that have been shown to be associated with poor glycaemic control include younger age, number of years of education, longer duration of diabetes, insulin treatment and poor self-management behaviours (12, 13).

The GP is the primary point of contact between the health service and people with diabetes. There are substantial differences in the way that GP services are delivered in NI and ROI. In NI practices provide publicly funded care, free at the point of use, to a defined list of patients on a universal basis. The Quality Outcomes Framework (QOF) system, in place from 2004, provides financial incentives for GPs to maintain disease registers and meet quality indicators. The QOF system resulted in three simultaneous changes: better data collection by GPs, public information on the quality of care, and pay for performance (14). For diabetes, GPs are paid on the basis of having higher proportions of patients with biomarkers such as blood pressure, lipids and blood sugar in specified ranges as well as records of screening/examinations (15). However, beyond the upper thresholds of each QOF indicator, GPs had no financial incentives to improve care (16). In ROI, GPs have a mix of publicly funded and private fee paying patients. The mixed nature of GP care in ROI means that GPs who work longer hours can earn more revenue from private patients which may incentivize them to provide easier access through, for example, extended working hours. In contrast in NI, the revenue that a GP practice earns is largely determined by the list size. In ROI, prior to the Cycle of Care programme, established in 2015, there was no specific financial support for GPs providing primary care to patients with diabetes. Diabetic care was unstructured and record keeping by many GPs was poor (17). However, structured reviews and record keeping are only one component of quality primary care. Access and quality of interaction in GP consultations, continuity of care, and access to practice nurses are important components of care quality (11, 18, 19). The supply of GPs has been shown internationally to be associated with improved outcomes, such as reduced mortality (20). In this context it is notable that there are fewer GPs in NI per capita than in ROI; the average GP list size was 1,620 in NI in 2014 (21) and 1,175 in ROI (1,335 based on WTE), based on total number (head count) of GPs for 2014 and population numbers (22). While we do not have working time equivalent (WTE) values for GPs in NI, even if all GPs were working on a full time basis in NI, there would still be more supply in ROI. Differences in the supply of GPs may result in shorter consultation durations (23, 24) and longer waiting times for non-emergency consultations in NI, as in the rest of the UK (25, 26). Practice nurses play an increasingly important role in the provision of primary care (27). As with GPs there are more practice nurses per capita in ROI. In ROI there are 0.26 practice nurses per 1,000, this compares with an average of 0.2 in NI (22, 28, 29).

Cost has been shown to be an important factor in the demand for GP care (30). While GP care is free at the point of use for patients in Northern Ireland, a substantial minority (31.5%) of people in ROI with diabetes are not covered by the medical card or GP visit card schemes and will have to pay for their GP care (31). For those who have to pay out of pocket for a GP consultation, the cost of a consultation is in the region of €50, which may represent a significant

deterrent to attending (32, 33). While the cost of attending the GP may be a deterrent for some people it may, by reducing demand, reduce capacity constraints that permit easier access for others (34). The higher cost of inpatient services and longer waiting times in ROI (in 2014) may also increase the proportion of services delivered through primary care (35, 36).

A number of demand side factors, other than need, are also likely to influence differences in the utilisation of GP services under the two systems including cost, geographic accessibility and time cost (37). NI has a population density of just under twice that of ROI, which may lead to differences in transport times to GPs in the two jurisdictions. However, while significant differences in the transportation times and cost for urban and rural patients have been shown in ROI; these have not been shown to translate into differences in utilisation (38). Employment status may also be related to the utilisation of GP care, both as a covariate of need and also by increasing the opportunity cost of attending the GP; however, there is little variation (36% vs 35%) in the employment rates of the over 50 s age group between the two jurisdictions (39, 40).

In this study, we examine, for patients aged 50 and over with diabetes, differences between NI and ROI in the number and type of health care contacts and clinical outcomes.

2. Methods

The TILDA and NICOLA surveys, used in this study, are based on interviews and health assessments with approximately 8,000 people representative of the population aged 50 and over in both ROI and NI (see (41) and (42) for further details of the TILDA and NICOLA studies, including design, methodology, and assessments carried out). The health assessment comprised of a physical examination and a blood test carried out by a nurse at a health centre. Older people are the main population of interest for examining healthcare utilisation by people with diabetes given this is where the disease is most prevalent - based on the Scottish Diabetes register 84 per cent of people with diabetes (Type I and Type II) are over the age of 50 (43).

The TILDA and NICOLA surveys are ideally designed for comparison with each other due to the similarity in the two surveys. Each survey consists of computer-assisted personal interviewing (CAPI) surveys containing identical questions on diabetes diagnosis and complications. Self-reported doctor diagnosed diabetes, directly comparable across the two surveys, is used in this study. Survey work for TILDA was carried out in 2011 (Wave 1), survey work for NICOLA was carried out in 2014–2016 (Wave 1).

Matching is a method for rebalancing observational data (44). A key advantage of matching over regression analysis is a reduced dependence on assumptions about functional form (45). A Coarsened Exact Matching (CEM) approach is used here to match treatment and control observations. CEM is a type of matching process that involves the temporary coarsening of continuous variables followed by a direct matching between the treated and untreated groups. The CEM method involves categorising coarsened continuous variables into user defined groups. A stratum is created for each unique observation in the data set. Observations are dropped that do not have at least one treatment and control in the stratum. Thus, the CEM process involves pruning both treated and control units (46). This method was chosen over the Mahalanobis distance method of matching as we wish to match on a combination of continuous and dichotomous variables (47).

In this study the treatment is the healthcare system in which individuals receive care for their condition. Matching is done based on the presence and severity of health needs. The key outcomes of interest are the levels and types of healthcare use. Health needs are captured in age, sex, education, current smoking status, self-reported health, the number of chronic illnesses and the number of diabetic complications reported. Diabetic complications are defined here as heart attack, stroke, leg ulcers, kidney disease, neuropathy, retinopathy and nephropathy. These matching variables were selected based on previous findings from TILDA of the covariates of healthcare utilisation (48). A count of the number of diabetic complications is included as this has been shown to correlate with hospital utilisation (49). Body Mass Index (BMI), glycosylated haemoglobin (HbA1c) and other biometric markers are not included in the analysis of health care utilisation as they are only available for the subsample that attended the health assessment. Observations with missing data in the variables used for matching were omitted.

3. Results

3.1 Prevalence of Diabetes

Figure 1 shows the percentage of individuals who report having received a diagnosis of diabetes from their doctor by sex and age group in NI and ROI. The prevalence rates for NI are higher across all age groups and genders. The overall prevalence in the 50 to 84 years old age group is 3.4 percentage points higher in NI (11.1% in NI, 7.7% ROI, p-value < 0.01). There are no observations in ROI for those in the over 85 years age group.

The rates of diabetes shown here for ROI are in line with previous studies for ROI (50-52). Based on TILDA estimates of the prevalence of diabetes by age group and gender and 2016 census data, there are 106,207 people over the age of 50 in ROI with diabetes. The rates of diabetes shown in the NICOLA data are consistent with the total number of cases of diabetes registered in Northern Ireland (1). The estimated number of people over 50 with diabetes based on the NICOLA prevalence rates was 67,941 in 2014. This represents 83 per cent of the 81,867 people in NI with a diagnosis of diabetes in the same year on the diabetes register. This is in line with the proportion of people with diabetes who are over 50 on the Scottish Diabetes register (43). In both jurisdictions rates are higher among men than women.

There is no indication from the data available that the higher prevalence rates in NI are due to higher case ascertainment. Among those for whom HbA1c data were available, the rates of undiagnosed diabetes (HbA1c > 48 mmol/mol (6.5 %) and no report of a diabetes diagnosis) are also higher in NI (0.8% in ROI vs 4.4% in NI). While alternative data sources for the rates of undiagnosed diabetes in ROI show substantially higher rates compared to TILDA they are still lower than in NI (53).

3.2 Health of People with Diabetes

Table 1 shows the demographic and health status of the samples of people with diabetes in ROI and NI. There are no differences ($p > 0.05$) in the gender and current smoking status of the two samples, the sample from NI is slightly older. As previously reported, people in the NI have significantly lower levels of self-reported good health status and higher rates of education (54). People with diabetes in NI have substantially more complications related to diabetes; the proportion of people with diabetes with two or more complication is 8.9 percentage points higher ($p < 0.001$) in NI. Rates of stroke, kidney disease and neuropathy are all significantly higher in NI. The number of other chronic diseases that people with diabetes have is also higher in NI; the proportion of people with diabetes, with three or more other chronic conditions is 9.4 percentage points higher ($p < 0.001$) in NI. Chronic lung disease, asthma, arthritis, alcohol or substance abuse, emotional, nervous or psychiatric problems, hypertension and angina are all significantly higher in NI ($p < 0.05$). In summary, the sample of people with diabetes in NI appear substantially “sicker” than the sample from ROI.

Table 1. Summary Statistics (Before Matching)

	ROI (TILDA)	NI (NICOLA)	p-value
Number of People Surveyed	8469	8212	
Number of People with Diabetes	634	902	
Age (Mean)	66.4	67.5	0.018
Male (%)	58%	56%	0.430
Primary Education Only	41%	35%	0.014
Current Smoker	17%	16%	0.685
Good Self Related Health	50%	38%	<0.001
<i>Diabetic Complications</i>			
None	64%	53%	<0.001
One	26%	28%	0.58
Two +	10%	19%	<0.001
Heart Attack (%)	11.5%	14.1%	0.142
Stroke (%)	6.3%	9.6%	0.020
Leg ulcers (%)	3.8%	4.3%	0.601
Kidney disease (%)	6.5%	14.3%	<0.001
Neuropathy (Nerve Endings) (%)	14.2%	19.2%	0.011
Retinopathy (%)	7.4%	9.2%	0.215
Nephropathy (Kidney) (%)	3.6%	8.2%	<0.001
<i>Treatment</i>			
Insulin (%)	78.5%	75.2%	0.124
Tablets (%)	16.9%	20.5%	0.074
<i>Other Chronic diseases</i>			
None	18%	12%	0.001
One	34%	31%	0.230
Two	30%	29%	0.760
Three+	19%	28%	<0.001
Chronic lung disease (%)	4.7%	8.5%	0.004
Asthma (%)	11.4%	14.9%	0.048
Arthritis (%)	32.2%	42.4%	<0.001
Osteoporosis (%)	5.4%	6.9%	0.229
Cancer (%)	7.3%	9.3%	0.154
Any emotional, nervous or psychiatric problems (%)	9.9%	15.7%	0.001
Alcohol or substance abuse (%)	2.2%	4.1%	0.042
Stomach ulcers (%)	7.4%	1.1%	<0.001
Varicose Ulcers (%)	3.8%	5.9%	0.065
High blood pressure or hypertension (%)	61.5%	66.7%	0.004
Angina (%)	11.4%	15.9%	0.048

3.3 Health Care Utilisation

Table 2 shows the healthcare utilisation of people with diabetes in NI and ROI before and after matching. Matching is carried out based on age, sex, education, smoking status, self-related health, number of diabetic complications and number of chronic illnesses. As can be seen from the table, after the matching process, which mainly pruned off high need cases in NI, the healthcare utilisation of the NI group reduced in all areas of utilisation. The between group differences in primary care increased, the between group differences in secondary care utilisation reduced, and in most cases cease to be statistically significant. In the case of inpatient nights however, NI patients continue to consume significantly more care. Interestingly substantially more people in NI with diabetes reported not having attended their GP in the last year (ROI 4.5%, NI 9.3%, p -value = 0.006).

Table 2. Healthcare utilisation in the last 12 months

	Before Matching			After Matching		
	ROI (TILDA)	NI (NICOLA)	p-value	ROI (TILDA)	NI (NICOLA)	p-value
Observations	634	902		420	486	
GP Visits (Mean)	5.7	5.6	0.668	5.6	5.0	0.108
GP Visits: None	4.2%	7.9%	0.004	4.5%	9.3%	0.006
Outpatient Visits (Mean)	2.1	3.6	<0.001	2.1	3.2	0.079
A&E Visits (Mean)	0.3	0.5	0.010	0.3	0.4	0.290
Hospital Nights (Mean)	1.2	2.1	<0.00	1.2	1.8	0.039

4. Discussion

In this study we compare the health and patterns of healthcare use among two representative surveys of older people with diabetes on the island of Ireland. Despite their proximity the surveys highlight that there are substantial differences in the health of the older population in general, and people with diabetes in particular, between NI and ROI. On an age and gender adjusted basis there is a substantially higher prevalence of diabetes in NI. It is not likely that this difference can be explained by the differences in the healthcare system between the two jurisdictions or simply enhanced case ascertainment. Broader societal factors, that may include attitudes to diet physical exercise, other diseases or possibly cumulative lifetime stress may explain the difference in the prevalence rates.

Our results also show that among people with diabetes, those in NI have more complications and more chronic illnesses in general than people with diabetes in ROI. A range of factors will play a role in the extent to which people are able to manage their diabetes and remain complication free. We are not able to distinguish between these causal factors. The differences in societal factors, indicated by the different prevalence rates, might also explain higher complication rates.

It is notable there is a higher prevalence among people with diabetes in NI of non-attendance at the GP in the past 12 months. As the cut points (proportion of people with diabetes on a practices register) for payments, however, are currently set there are no financial incentives to seek out the people who do not attend once the practice reaches a certain cut off point. This may contribute to poorer disease management and in part explain the greater use of hospital services in Northern Ireland. Higher levels of hospital utilisation in Northern Ireland may also be due to higher levels of supply (55)

People with diabetes typically have other chronic conditions (56). By adjusting for the "sickness" of the people with diabetes in NI and ROI through matching we show that healthcare utilisation with the exception of inpatient care is similar in both jurisdictions despite significant differences in healthcare systems. This is similar to previous findings based on different data sources (52). However, the previous study did not have detailed information on diabetic complications and other chronic illnesses. While not statistically significant, the results point towards a more primary care focused service in ROI, with more frequent GP visits and less frequent secondary care visits.

This finding highlights that there are multiple aspects to quality primary care. The record keeping and pay for performance that were incentivised by the QOF system are only one aspect of quality primary care. Other aspects, such as the amount of consultation time and appointment waiting time of GPs are driven by the number of full time operating GPs. While direct financial incentives were not in place at the time in ROI for diabetes care, there were substantially more GPs per capita which has been shown to improve outcomes (20). This may have contributed to improved care quality perhaps through longer consultation time or increased continuity of care.

The Cycle of Care policy was introduced in ROI in 2015, subsequent to the TILDA data used in this paper. This policy incentivises GPs to provide structured annual reviews and improved records. While this may improve patient care in ROI any decline in the availability of GPs may counteract any positive benefits.

5. Limitations

The data used in this study are based on two large representative cross sectional surveys. The presence of diabetes, complications, and healthcare utilisation are all self-reported, running the risk of recall bias. However, there is no reason to believe that this would apply differentially across jurisdictions. The severity of reported health conditions is not available in the data; the variation in health care needs may not be fully captured by the number of chronic illnesses or the number of diabetic complications. The age and gender adjusted prevalence rates of diabetes and diabetic complications are compared at two time points over three years apart; a comparison of these rates on the same year may reduce or increase the scale of the differences depending on the relative difference in the incidence of diabetes and complications in that three year period.

6. Conclusion

This study shows that the prevalence and severity of diabetes, among those aged 50 and over, is higher in Northern Ireland than in the Republic of Ireland. The study shows that for cohorts with comparable health care needs, with the exception of inpatients nights, there is no significant difference in patterns of healthcare use. The lack of difference in GP utilisation, despite greater severity, combined with higher rates of GP non-attendance in NI suggest a closer examination of primary care is worthy of investigation. While during the period of study GPs in ROI were not incentivised in the same way to register and manage diabetes, in NI a lower supply of GPs and perversities in the QOF system may have served to undermine the delivery of quality, an issue that warrants closer examination.

7. Abbreviations

BMI
Body Mass Index
CEM
Coarsened Exact Matching
GP
General practitioner
QOF
Quality and Outcomes framework
NI
Northern Ireland
ROI
Republic of Ireland

8. Declarations

Ethical Approval

Ethical approval for the study was obtained from the School of Medicine, Dentistry and Biomedical Sciences Ethics Committee, Queen's University Belfast.

Consent for publication

Consent for publication received by data collectors: TILDA and NICOLA.

Availability of data and materials

The data that support the findings of this study are available on request from TILDA (<https://www.ucd.ie/issda/data/tilda/>) and NICOLA (<https://www.qub.ac.uk/sites/NICOLA/>).

Competing interests

The authors declare no competing interests

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Authors' contributions

CON, TP and LB contributed to all stages of the study from conception to drafting; AM, LG and SC contributed to the drafting of the manuscript. All authors read and approved the final manuscript.

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Figures

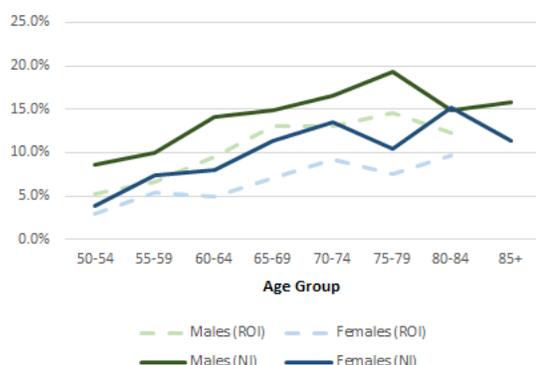


Figure 1

Prevalence of diabetes by gender and age category