The impact of travel distance, travel time and waiting time on health-related quality of life of diabetes patients: An investigation in six European countries.

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U.K. developed the basic conception of the questionnaire, coordinated the surveys in all study countries, organized the survey in Germany, elaborated the basic conception of the paper, performed the statistical analyses and wrote most parts of the paper. U.K. also takes responsibility for the contents of the article. T.B., S.E., R.F., P.F., E.K., T.M., E.P., and P.T. assisted in developing the questionnaire and organized the survey in their countries. M.M. performed several additional supportive analyses. All authors have discussed the conception of the article, critically reviewed the article and given important contributions to its refinement. All authors have read and approved the final manuscript.

Conflicts of interest

None of the authors have any conflicts of interests.

Abstract

Aims: The effects of travel distance and travel time to the primary diabetes care provider and waiting time in the practice on health-related quality of life (HRQoL) of patients with type 2 diabetes are investigated.

Research Design and Methods: Survey data of 1313 persons with type 2 diabetes from six regions in England (274), Finland (163), Germany (254), Greece (165), the Netherlands (354), and Spain (103) were analyzed. Various multiple linear regression analyses with four different EQ-5D-3L indices (English, German, Dutch and Spanish index) as target variables, with travel distance, travel time, and waiting time in the practice as focal predictors and with control for study region, patient's gender, patient's age, patient's education, time since diagnosis, thoroughness of provider-patient communication were computed. Interactions of regions with the remaining five control variables and the three focal predictors were also tested.

Results: There are no interactions of regions with control variables or focal predictors. The indices decrease with increasing travel time to the provider and increasing waiting time in the provider's practice.

Conclusions: HRQoL of patients with type 2 diabetes might be improved by decreasing travel time to the provider and waiting time in the provider's practice.

Keywords

Type 2 diabetes mellitus;

Travel distance to provider;

Travel time to provider;

Waiting time in provider's practice;

Health-related quality of life;

EQ-5D.

1 Introduction

The interaction between diabetes care provider and patient constitutes an essential component in diabetes care [1-4]. In this interaction the provider diagnoses the patient's medical condition; discusses with the patient the further course of treatment; gives access to drugs and other medical equipment; counsels the patient; and supervises the patient's adherence to the treatment. Without a functioning interaction between provider and patient the patient will not fully benefit from the rich medical knowledge regarding the treatment of diabetes. Therefore, a functioning interaction between provider and patient and, accordingly, appropriate access to the provider should be guaranteed. First of all, this access depends upon the insurance status of the patient [5-8]. However, even when diabetes treatment is free or at least affordable for everybody, access to the providers is not necessarily always the same for every patient. It might vary depending on the manner in which the service of the provider is delivered. It might depend upon the travel distance and/or travel time to the providers' locations and upon the temporal availability of the providers as determined by opening hours and waiting times.

There are currently few studies addressing location or temporal aspects of service delivery on health outcomes. There is some evidence that increasing travel distance to the primary diabetes care provider decreases glycemic control [9-11] and increases mortality [12]. There are no comparable studies addressing temporal aspects of service delivery. There is, however, one empirical evaluation of a program for reducing waiting times, i.e. advanced access scheduling [13]. According to this evaluation study, applying advanced access scheduling for one year leads to a slight improvement of glycemic control in comparison with clinics in which this program has not been applied.

The above studies provide very valuable insights. However, in seeking to optimize diabetes care with regard to needs directly experienced by the patients, it is not sufficient to focus solely on glycemic control as a target variable. Instead it is necessary to investigate how the different aspects of service delivery affect patients' health-related quality of life (HRQoL). Especially HRQoL in the sense of societal evaluations of the patients' overall health-states, i.e. evaluations which reflect the preferences of all members of the society, are of interest. HRQoL in this sense is needed as a basis for financial decisions pertaining to the health system. Accordingly, HRQoL in this sense is applied to compute Quality Adjusted Life Years (QALYs) in cost-utility analyses as they are performed in health-economics [14-15]. Hence, knowledge about the impact of aspects of service delivery in diabetes care on the patients' HRQoL in the sense of a societal evaluation would directly provide starting points for optimizing diabetes care with regard to the patients' needs in a cost-effective manner.

Measuring HRQoL in the sense of societal evaluations requires special instruments, i.e. preference-based index measurement instruments. Each instrument of this kind is based on a multi-attribute classification system for distinguishing health states, which is given by the questionnaire. A further component of each preference-based index measurement instrument is a scoring function which assigns a societal evaluation to each health state distinguished within the classification system. The scoring function is given as part of the instructions for evaluating the corresponding answers and is determined on the basis of preference judgments given by a person sample which should be as representative of the society in question as possible [16]. As a prerequisite for computing QALYs scoring functions are always standardized with 1 for full health and 0 for death [14-15]. The resulting value set is often referred to as an index [15,17].

The best known examples of preference-based index measurement instruments are the EQ-5D with its 2 versions EQ-5D-3L and EQ-5D-5L [18-20], the HUI with its 2 newer versions HUI II and HUI III [21-22], and the SF-6D [23-24]. Hitherto, the EQ-5D-3L is the most commonly applied of these instruments. The classification system of the EQ 5D 3L is defined by five questions which address 'Mobility', 'Self-care', 'Usual Activities', 'Pain/Discomfort', and 'Anxiety/Depression'. Three answer categories are given for each question. The first of these categories represents 'no problems at all'; the second 'moderate problems'; and the third 'extreme problems'. Presently there are 172 official language versions of the EQ-5D-3L [25] and several different scoring functions reflecting the preferences in different countries [26].

The contribution presented here aims at providing information as to how travel distance and travel time to the health care provider as well as waiting time at the health care provider's practice influence HRQoL indices based on the EQ-5D-3L. For this purpose data which were originally collected in a major European project concerned with health provider networks [27] were re-analyzed. In this project, surveys of patients with type 2 diabetes were conducted in networks for diabetes care from England, Finland, Germany, Greece, the Netherlands and Spain. The EQ-5D-3L was applied as a component of the survey questionnaire. There is empirical evidence that the items of the English, Finnish, German, Dutch, Greek and Spanish EQ-5D-3L version function in the same way [28]. As the results provided by the analyses presented here apply first of all to the six study countries, the EQ-5D-3L indices referring to these countries were used as far as scoring functions for computing such indices were presented in Medline listed papers and as far as these functions were empirically meaningful in the sense theory of measurement [17]. These were the indices for England [29], Germany [30], the Netherlands [31] and Spain [32].

2 Material and Methods

2.1 Study regions, study participants and study conduction

One network in each country was investigated: the London Borough of Tower Hamlets in England; the region of Keski-Suomi in Finland; the city and rural district of Bamberg in Germany; the regional unit of Herakleion on the island of Crete in Greece; the region Nieuwe Waterweg Noord en Delft Westland Oostland in the Netherlands; and the region of Valencia in Spain. In England seven general physician practices associated with the Tower Hamlets Primary Care Trust were investigated; in Finland the health centers of eight municipalities within Keski-Suomi; in Germany the practices of one general physician and one diabetologist in the city of Bamberg, and of two general physicians and one diabetologist in the rural district of Bamberg; in Greece, five different institutions providing outpatient care for diabetes; in the Netherlands, five general practitioner health centers; and, in Spain, one primary health area.

The surveys of the diabetes patients were performed with the assistance of the diabetes care providers investigated. These providers selected the patients to be approached for participation according to criteria defined by the researchers. Inclusion criteria for participants were 1) that they were being treated for type 2 diabetes by the health providers investigated in the project and 2) that they were at least 18 years old. The patients were contacted either by post or directly given the questionnaire when visiting their health care provider. The patients who participated in the survey completed their questionnaires on their own without any intervention by personnel from the service provider or research team. Depending on the most feasible method for the particular provider the participants returned their completed questionnaires either by mail directly to the local project study centers, or to the care provider who then passed them on to the study centers. All surveys were approved by national ethics committees with the exception of Bamberg where the approval was granted by the ethics committee of the University Medical Center of Erlangen and with the exception of Herakleion where approval was granted by the relevant committee of the hospital. Data were collected between October 2011 and March 2012.

2.2 Study variables

The questionnaire used for the surveys contained various items addressing socio-demographic features, health, health-related behavior and health treatment. However, only selected elements of these items were applied in the analyses presented here. These will be described in the subsections below.

2.2.1 Exclusion criteria

The questionnaire contained two questions addressing the participant’s competence in mastering the questionnaire language. These questions were used to identify those responders who had insufficient mastery of the questionnaire language and were thus excluded from the analyses.

2.2.2 Basic medical characteristics

The questionnaire also contained questions regarding the participants’ weight, height, HbA1c value, systolic blood pressure and cholesterol level.

2.2.3 Control variables

Some of the questionnaire items referred to variables which had to be controlled in the analyses because they can be expected to influence health states and, by way of this, HRQoL. These were age, gender, educational attainment, the year when the patient's diabetes was diagnosed, and the thoroughness with which the provider communicated with the patient. Educational attainment was assessed by asking participants whether they had left school after the minimum school leaving age of their country. Those answering 'yes' were classified as having a lower level of educational attainment than those who answered 'no'. The year of their diagnosis was used to compute the duration of the diagnosed diabetes at the time of the survey. The question concerned with the provider-patient communication was 'How often does your main diabetes health care provider discuss with you your diabetes related problems so thoroughly that you do not have any further questions?'. The answer modality was a five category scale with the two extreme categories labeled 'Never' or 'Always' respectively.

2.2.4 Focal predictors

The questionnaire contained three questions regarding the three variables which are investigated as focal predictors: travel distance; travel time; and waiting time in the practice. The questions about travel distance and travel time referred to the travel from the place from which the patient usually set off to visit the provider to the provider's place. Except for the English patients (who were asked to report in miles), travel distance was assessed in kilometers. Travel and waiting time were assessed in minutes.

2.2.5 Target variables

The questionnaire also contained the EQ-5D-3L questionnaire on which the target variables, i.e. the indices of HRQoL, are based (see above).

2.3 Study participants included in analyses

Study participants returning a questionnaire were excluded from the analyses when they did not have sufficient mastery of the questionnaire language and also when there were too few data supplied by a participant, i.e. when data for more than two of the five control variables, more than one of the three focal predictors, or more than two of the five EQ-5D-3L items were missing.

2.4 Statistical analyses

Descriptive statistics were computed for exclusion criteria, basic medical characteristics, control variables, focal predictors, and target variables. Percentages were computed for dichotomous variables; means, standard deviations, and minima and maxima for continuous variables. This was undertaken for both the total sample and separately for the six region-specific samples. Region differences regarding dichotomous variables were statistically tested using chi-square tests, and region differences regarding continuous variables using multiple linear regressions with dummy coded regions as the predictor variable. To cope with skewed distributions within the different regions, region differences regarding continuous variables were also tested using Kruskal-Wallis tests.

Missing data for control variables, the focal predictors and EQ-5D-3L items were handled with two alternative approaches: (1) only participants without missing data were included in the analyses; and (2) missing data were imputed using multiple imputations [33]. The imputation of each of these variables was based upon a model with the remaining of these variables and dummy coded regions as predictors. Age, time since diagnosis, thoroughness of communication and all focal predictors were handled as metric variables and constrained to the range of values defined by the valid data. The five EQ-5D-3L items were handled as ordinal variables with a limited set of categories. Gender, education and dummy coded region were handled as nominal variables. To limit the impact of the stochastic part in the imputation on the resulting statistics, 1000 different data sets with imputed values were produced. The four different EQ-5D-3L indices were computed on the basis of the resulting data sets.

Two alternative approaches were applied to control for the influence of the regions and the control variables: (1) the original value approach and (2) the residual value approach. In the original value approach the four different EQ-5D-3L indices were regressed via multiple linear regression models on dummy coded regions, control variables, and focal predictors. In the residual value approach the focal predictors and the EQ-5D-3L indices were first regressed on dummy coded regions and control variables and, subsequently, the unstandardized residuals for the EQ-5D-3L indices were regressed on the unstandardized residuals for the focal predictors.

All analyses were performed for the total sample. To test for region-specific differences between the regression coefficients, further regression models containing interaction terms with dummy coded countries were computed. In the original value approach the interactions of dummy coded countries with the control variables and the focal predictors were included; in the residual value approach these were the interactions with the residuals of the focal predictors. A statistically significant increase in the proportion of variance explained by the model with interaction terms in comparison with the corresponding model without interaction terms was taken as evidence for region specific differences between the regression coefficients. In this case further regression models were computed each of which only contained the interactions of dummy coded country with one of the variables in question. A statistically significant increase in the proportion of variance in comparison with the corresponding model without interaction terms was taken as evidence for region specific differences between the regression coefficients for that variable for which the interaction terms had been included.

When the regression analyses were performed with imputed data, the unstandardized regression coefficients were determined by aggregating the corresponding estimates from the multiple data sets using the rules proposed by Rubin [33]. The corresponding standard errors, which were used for inference statistical testing of the unstandardized regression coefficients, were also determined according to the aggregation rules of Rubin. The standardized regression coefficients were computed by first estimating standard deviations for the predictor and the criterion variables from all 1000 data records resulting from the multiple imputations together and then using these standard deviations for deriving the standardized regression coefficients from the unstandardized coefficients. The unadjusted multiple R^2 (i.e. the estimates for the proportion of variance explained by the respective model), were determined by computing the model for all 1000 data sets together. For computing adjusted multiple R^2 and for performing statistical inference tests referring to multiple R^2s the sample size of one single data set was presupposed.

3 Results

More than 6000 questionnaires were distributed of which 1638 were returned and 1313 met the inclusion criteria (see Table 1). The proportion of excluded questionnaires is largest in England (42.3%) which is due to the fact that about 40% of all respondents in this sample were of Bangladeshi ethnicity who, due to lower levels of stated proficiency in the English language, did not meet the inclusion criteria for this analysis. Altogether, 21.0% of the distributed questionnaires were included in the final analyses when missing data were imputed and these proportions vary from 8.2% for England to 55.0% for Germany (see Table 1). Basic medical variables are distributed as can be expected for samples of type 2 diabetes patients (see Table 1).

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Insert table 1 about here

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In the sample of study participants included, 2.9% of the data for the investigated variables are missing. Within the control variables and focal predictors the percentages of missing data range from 0.6% for age to 11.3% for time since diagnosis (see Table 2). For the EQ-5D-3L items the percentages of missing values are 0.5% (4/1313) for mobility, 0.7% (9/1313) for self-care, 0.4% (5/1313) for usual activities, 0.8% (10/1313) for pain/discomfort, and 1.8% (23/1313) for anxiety/depression. There are 935 participants with data for all variables considered in the main analyses (see Table 1). The six study regions differ with regard to all investigated variables except for gender (see Table 2).

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Insert table 2 about here

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In only one of 16 investigated cases (i.e.: missing data imputed; original value approach; Dutch index) the model with all interaction terms explained significantly more variance than the model without any interaction terms. However, in this case none of the models with interaction terms for only one predictor variables explains significantly more variance than the model without any interaction terms. Hence, in none of the 16 analyses the regression coefficients differ essentially between the countries. The original value approach and the residual value approach render virtually the same regression coefficients for the focal predictors when applied to the same data set and the same index. Therefore, only the regression coefficients determined with the residual value approach for the total sample are presented here (see Table 3).

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Insert Table 3 about here

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When only the complete data sets are considered the three focal predictors always explain a larger proportion of variance than in the case when data with missing values imputed are considered (see Table 3). Except for this difference the analyses of both data sets provide very similar results. The travel distance to the provider has no impact on HRQoL independently of which index is applied, whereas all indices decrease in a statistically significant manner with increasing waiting time in practice (see Table 3). For travel time to the provider the results are less distinct. When only the complete data sets are considered then travel time has a statistically significant effect on all four indices of HRQoL. HRQoL decreases with increasing travel time (see Table 3). The same tendency shows for the data set with missing values imputed. However, for the German and the Spanish index this tendency is no longer statistically significant (see Table 3).

4 Discussion

The study presented here has been performed with six person samples which stem from six different regions. These samples are very different (see Table 2). . Relationships determined on the basis of such heterogeneous data can be expected to be well generalizable. The fact that there are no interactions between the regions and the other variables is further evidence for the generalizability of the results. However, the sample sizes for the individual regions are not very large and with larger sample sizes some of the interactions might become statistically significant. Yet, as no interaction effect was detected with the given sample sizes, interaction effects detected with larger sample sizes are unlikely to be very strong.

The study is merely correlational, i.e. all variables have been assessed at the same time without a voluntary manipulation of the focal predictors. Consequently, the data do not tell us whether the statistical significant relationships between two of the focal predictors and the indices are actually causal with the focal predictors being the cause. This can only be assumed based on plausibility. This assumption, however, is trustworthy enough to substantiate pilot interventions in which the hypothesized cause variable is manipulated to affect the hypothesized cause. If such an intervention is evaluated with a randomized controlled trial this will give clearer information about causality.

Travel distance, travel time and waiting time have been determined by asking the study participants. Accordingly, these variables are less reliable than physical measurements. However, as long as the participants' estimations vary by chance with the true values as means, the statistics obtained from a large sample of participants will be quite accurate.

Missing values were treated in two different manners: (1) only complete data sets and (2) data sets with missing data imputed were analysed. Moreover, two different approaches, i.e. (1) original value approach and (2) residual value approach, were applied for statistical analyses. The latter two approaches provided virtually the same results. This enhances trustworthiness of the results. However, when only complete data were analyzed the proportions of explained variance were always higher than when data with missing values imputed were analysed. There are at least two possible explanations for this difference: (1) the approach applied for imputing missing data creates more disturbances in the data than adequate; and (2) the data provided by people who have skipped some questions have a lower quality than those of people who answered all questions. Both explanations imply that if both approaches provide different results regarding the regression coefficients the results of the analyses with only complete data sets are more likely to be true.

EQ-5D-3L indices decrease significantly with travel time to the provider, whereas travel distance has no statistically significant effect. These results contain important new information. In previous studies, only travel distance but not travel time was considered [9-12]. The results which emerge when both variables are investigated together suggest that the previous findings are not caused by the distance itself but by the travel time (which is usually correlated with distance). This, in turn, means that the negative effect of travel distance can, to a certain extent, be compensated by a good road and a good public transport system.

The results regarding waiting time in the practice also provide new information. Hitherto there was only very weak empirical evidence that temporal availability of the provider has an effect on patients' health [13]. The results presented here corroborate this effect. In addition to this they show that this effect not only pertains to glycemic control, but also to health as it is perceived by the patients themselves. There are at least two possible explanations for the relationship between waiting time and EQ-5D-3L indices. One explanation is that waiting time is an indicator of overload of the provider and that this overload leads to poorer care delivered by the provider. The other explanation is that longer waiting time detains the patients from visiting the provider on occasions when they should do, and that these limitations on their visits lead to reduced care. The first explanation can, by and large, be ruled out because the thoroughness of provider-patient communication has also been included in the regression analyses and because this variable would also indicate overload. So, it is very probable that the second explanation is true. If this is actually so then modifications of the waiting time in the practices will have a direct impact on the health as perceived by the patients.

The unstandardized regression coefficients referring to travel time and waiting time are quite small. However, the target variables, i.e. the EQ-5D-3L indices, are represented by a very small interval of numbers. The complete range of health states between death and full health is mapped onto the interval between zero and one.

Moreover, travel time and waiting time are measured in minutes, i.e. the unstandardized regression coefficients represent the decrease of EQ-5D-3L indices caused by one single additional minute for travel time or waiting time. The decrease caused by ten additional minutes is ten times as large. Note further that the conception of a minimal clinically relevant difference does not apply to indices of HRQoL. From the perspective of health economics, the only relevant question is whether the difference is worth the money it costs. The effects of several cost-effective interventions with small effects can add up to a cost-effective large effect. Accordingly, also interventions with very small effects should be undertaken when they do not cost too much.

If the relationships found in the analyses are actually causal with HRQoL being the effect and the focal predictors being the causes, then these results indicate that the HRQoL of diabetes patients can be improved by reducing travel time to the providers and waiting time in the providers' practices. This should be tested by implementing interventions in which travel time and/or waiting time in the provider practice is reduced and by evaluating whether these interventions actually increase HRQoL. If the interventions show to be successful applying these interventions in routine practice would bring a lot of benefits for the patients.

The first step to designing the interventions just outlined is looking for measures by means of which travel and waiting times can be reduced. For travel time there are two main approaches. The first is distributing diabetes care in such a way over the regions that all inhabitants of these regions can reach diabetes care with the existing road and public transport system in as short a time as possible. This can be done either by distributing those persons who presently perform the diabetes care over the regions or by delegating diabetes care from more central providers to providers who are closer to the patients. The second approach is improving the existing road and public transport system. However, in many countries both approaches already apply to the fullest extent practicable. Hence, there do not seem to be many chances to improve HRQoL of diabetes patients in a cost-effective manner by intensifying efforts along these lines. By contrast, there might be more potential still to reduce waiting times in practices by better organization of the appointments system and the organization of work in the practices. Taking this route might lead to very cost-effective improvements of HRQoL in diabetes patients.

Acknowledgments

The research leading to the results published in this article has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 241741. The surveys have been performed with the special assistance of Teresa Meneu and Antero Vanhala. The authors would like to express their gratitude to the participating healthcare service provider organizations for their co-operation and support in enabling the study to take place. These provider organizations were:

England: Dr. Gill Hood, North-East London Diabetes Research Network together with the Wapping Group Practice, the Spitalfields Practice, the Brayford Square Surgery, the Jubilee Street Practice, the Whitechapel Health Centre, the Tredegar Practice and the Chrisp Street Health Centre ;

Finland: the health centers of the municipalities of Joutsa, Keuruu, Konnevesi, Laukaa, Luhanka, Multia, Petäjävesi, and Toivakka ;

Germany: the practice of Dr. Hans Martini, Dr. Günter Kraus and Herbert Högen in Memmelsdorf represented by Dr. Günter Kraus, the practice of Dr. Hubert Metzner in Bamberg, the practice of Dr. Axel Schleß in Bamberg, the practice of Drs. Gerhard and Dorothea Thiel in Lisberg-Trabelsdorf represented by Dr. Dorothea Thiel, and the practice of Dr. Christian Weghorn in Pommersfelden represented by Dr. Richard Barabasch;

Greece: the Diabetes Center of the General Hospital of Herakleion, the local healthcare unit of the Health Insurance Fund, the Health Centre of Charakas and the municipal health center of Herakleion;

The Netherlands: the Healthcare Centre Tanthof in Delft, the Healthcare Centre De 1e Lijn in Den Hoorn, the Healthcare Centre Harris in Vlaardingen, the Healthcare Centre Nandoe en Schoute in ‘s Gravenzande, and the General Practitioner de Blooy in Hoek van Holland ;

Spain: the Primary Care Center Tendetes which is one of the primary health areas belonging to the Valencia-La Fe Health Department.

None of the authors have any conflicts of interests.

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Table 1: General information about the sample

	Total sample	**English region**	**Finnish region**	**German region**	**Greek region**	**Dutch region**	**Spanish region**
Statistics determining the study sample[a]							
Questionnaires distributed	6245	3343	436	462	600	779	625
Questionnaires returned	1638 (26.2%)	475 (14.2%)	183 (42.0%)	286 (61.9%)	179 (29.8%)	400 (51.3%)	115 (18.4%)
Sufficient language competence	1459 (23.4%)	313 (9.4%)	183 (42.0%)	282 (61.0%)	179 (29.8%)	387 (49.7%)	115 (18.4%)
Sufficient data[b]	1458 (23.3%)	404 (12.1%)	163 (37.4%)	258 (55.8%)	165 (27.5%)	365 (46.9%)	103 (16.5%)
Participants included	1313 (21.0%)	274 (8.2%)	163 (37.4%)	254 (55.0%)	165 (27.5%)	354 (45.4%)	103 (16.5%)
Participants with complete data[c]	935 (15.0%)	177 (5.3%)	118 (27.1%)	192 (41.6%)	129 (21.5%)	257 (33.0%)	62 (9.9%)
Medical characteristics of the study sample							
BMI							
Valid data[d]	1321	248	174	264	166	368	101
Mean	30.0	29.8	30.7	31.9	29.7	28.9	28.9
Standard deviation	5.8	6.8	5.9	6.2	4.6	5.0	5.0

HbA1c % (mmol/mol)							
Valid data[d]	726	79	94	197	119	189	48
Mean	6.5 (48)	6.6 (49)	6.4 (46)	6.9 (52)	6.0 (42)	6.4 (47)	6.7 (50)
Standard deviation	1.4 (15)	1.2 (13)	1.1 (12)	1.1 (12)	2.2 (24)	1.1 (13)	1.5 (17)
Systolic blood pressure							
Valid data[d]	975	112	160	230	144	243	86
Mean	135.0	127.1	135.5	135.4	132.9	138.5	136.5
Standard deviation	16.4	19.5	13.5	15.9	14.7	17.3	15.1
Cholesterol mmol/L (mg/dL)							
Valid data[d]	552	97	80	109	116	102	48
Mean	4.8 (185)	4.2 (164)	4.7 (180)	5.0 (192)	4.8 (186)	5.1 (198)	4.9 (189)
Standard deviation	1.5 (56)	1.4 (53)	1.3 (51)	1.3 (49)	1.4 (52)	1.8 (71)	1.4 (53)

[a] Percentages refer to questionnaires distributed.

[b] Participants with data for at least three of the five control variables, at least two of the three focal predictors, and at least three of the five EQ-5D-3L items.

[c] Data for all control variables, focal predictors and EQ-5D-3L items.

[d] Valid data vary due to missing values.

Table 2: Distributions of the investigated variables[a]

	Total sample	English region	Finnish region	German region	Greek region	Dutch region	Spanish region	Region differences
Control variables								
Gender								
Valid data	1290	269	159	253	165	343	101	
Male gender	57.2% (738)	59.9% (161)	62.9% (100)	51.4% (130)	57.0% (94)	57.1% (196)	56.4% (57)	Not significant[b]
Age in years								
Valid data	1305	272	161	254	165	351	102	
Mean (SD)	65.4 (11.1)	63.6 (12.6)	63.7 (9.5)	65.9 (11.1)	66.1 (10.5)	66.1 (10.2)	68.6 (11.6)	$p<0.001$[c,d]
Education								
Valid data	1243	249	151	246	160	342	95	
High education	54.3% (675)	38.2 (95)	58.3% (88)	65.4% (161)	26.9% (43)	75.1% (257)	32.6% (31)	$p<0.001$[b]
Time since diagnosis in years								
Valid data	1164	243	157	225	145	311	83	
Mean (SD)	10.5 (8.9)	9.7 (8.3)	9.7 (8.0)	12.0 (10.4)	10.8 (8.6)	9.1 (7.0)	14.9 (12.0)	$p<0.001$[c,d]
Thoroughness of communication[e]								

Valid data	1262	268	152	241	163	342	96	
Mean (SD)	4.1 (1.2)	3.9 (1.3)	4.2 (1.0)	4.2 (1.1)	3.9 (1.3)	4.4 (1.0)	3.4 (1.5)	p<0.001[c,d]
Focal predictors								
Travel distance to provider in kilometres								
Valid data	1253	246	158	251	161	344	93	
Mean (SD)	5.2 (10.3)	1.6 (2.8)	8.8 (10.2)	5.5 (6.1)	15.6 (20.5)	2.1 (5.6)	1.4 (1.3)	p<0.001[c,d]
Travel time to provider in minutes								
Valid data	1276	263	162	246	164	344	97	
Mean (SD)	14.8 (14.3)	14.8 (10.4)	16.3 (11.3)	13.3 (9.6)	29.2 (25.6)	8.6 (8.4)	13.7 (9.6)	p<0.001[c,d]
Waiting time in practice in minutes								
Valid data	1274	267	154	251	163	340	99	
Mean (SD)	27.6 (30.4)	18.9 (14.6)	13.4 (10.4)	42.8 (32.0)	55.0 (44.8)	13.0 (18.8)	39.0 (28.8)	p<0.001[c,d]
Target variables								
Valid data	1265	265	160	242	159	341	98	
EQ-5D-3L index for England								
Mean	0.77	0.70	0.81	0.77	0.69	0.85	0.75	p<0.001[c,d]

(SD)	(0.21)	(0.26)	(0.17)	(0.19)	(0.20)	(0.16)	(0.22)	
EQ-5D-3L index for Germany								
Mean (SD)	0.87 (0.14)	0.83 (0.17)	0.88 (0.11)	0.86; (0.13)	0.85; (0.14)	0.91 (0.11)	0.85 (0.15)	p<0.001[c,d]
EQ-5D-3L index for the Netherlands								
Mean (SD)	0.80 (0.19)	0.74 (0.23)	0.85 (0.15)	0.80 (0.18)	0.69; (0.19)	0.88 (0.14)	0.78 (0.19)	p<0.001[c,d]
EQ-5D-3L for Spain								
Mean (SD)	0.81 (0.20)	0.74 (0.24)	0.84 (0.15)	0.82 (0.18)	0.75 (0.19)	0.88 (0.14)	0.79 (0.22)	p<0.001[c,d]

[a] Valid data vary due to missing values.

[b] Pearson’s chi-square test.

[c] Multiple linear regression with ‘region’ as dummy coded predictor variable.

[d] Kruskal-Wallis test.

[e] Coded from 1 for ‘never’ to 5 for ‘always’.

Table 3: Impact of focal predictors on EQ-5D-3L indices[a]

	English index	German index	Dutch index	Spanish index
Analyses with complete data (n=935)				
Travel distance to provider (km)	0.0009 (0.044)	0.0003 (0.020)	0.0011 (0.060)	0.0007 (0.038)
Travel time to provider (min)	-0.0015 (-0.107)*	-0.0008 (-0.084)*	-0.0015 (-0.118)**	-0.0014 (-0.109)*
Waiting time in practice (min)	-0.0009 (-0.117)***	-0.0006 (-0.115)***	-0.0008 (-0.116)***	-0.0007 (-0.095)**
Adjusted multiple R^2	0.020***	0.018***	0.021***	0.016***
Analyses with missing data imputed (n=1313)				
Travel distance to provider (km)	0.0004 (0.018)	0.0000 (0.001)	0.0005 (0.028)	0.0001 (0.007)
Travel time to provider (min)	-0.0011 (-0.072)*	-0.0006 (-0.064)	-0.0010 (-0.076)*	-0.0009 (-0-067)
Waiting time in practice (min)	-0.0008 (-0.105)***	-0.0005 (-0.099)***	-0.0007 (-0.110)***	-0.0006 (-0.083)**
Adjusted multiple R^2	0.014***	0.012***	0.015***	0.009***

[a]All variables are unstandardized residuals from multiple linear regressions with dummy coded country, gender, age, education, time since diagnoses and thoroughness of communication as predictors. Except in rows for adjusted multiple R^2 the first number in the cell is the unstandardized and the number in brackets the standardized regression coefficient. Significance levels are * = p<0.05; ** = p<0.01; and *** = p<0.001.