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Association between Neighborhood-Level Deprivation and Disability in a Community Sample of People with Diabetes

Short running title: Neighborhood Deprivation and Disability

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Objective— The aim of the present study was to analyze the association between neighborhood deprivation and self reported disability in a community sample of people with type 2 diabetes.

Reseach design and methods—Random digit dialing was used to select a sample of adults with self-reported diabetes aged 18 to 80 years in Quebec. Health status was assessed by the World Health Organization Disability Assessment Schedule II. Material and social deprivation was measured using the Pampalon index, which is based on the Canadian census. Potential risk factors for disability included sociodemographic characteristics, socioeconomic status, social support, lifestyle-related factors (smoking, physical activity, and BMI), health care related problems, duration of diabetes, insulin use and diabetes specific complications.

Results— There was a strong association between disability and material and social deprivation in our sample (n=1439): participants living in advantaged neighborhoods had lower levels of disability than participants living in disadvantaged neighborhoods. The mean disability scores for men were 7.8 (SD=11.8), 12.0 (SD=11.8), and 18.1 (SD=19.4) for low, medium, and high deprivation areas, respectively ($p<0.001$). The mean disability scores for women were 13.4 (SD=12.4), 14.8 (SD=15.9), and 18.9 (SD=16.2) for low, medium, and high deprivation areas, respectively ($p<0.01$). Neighborhood deprivation was associated with disability even after controlling for education, household income, sociodemographic characteristics, race, lifestyle-related behaviors, social support, diabetes related variables and health care access problems.

Conclusions—The inclusion of neighborhood characteristics might be an important step in the identification and interpretation of risk factors for disability in diabetes.

Both cross-sectional and longitudinal studies have shown that type 2 diabetes is associated with a higher prevalence of disability. Because the prevalence of diabetes is increasing, an understanding of risk factors contributing to disability in people with diabetes has important clinical implications with respect to prevention strategies. Multiple factors have been identified in the development of disability in type 2 diabetic patients, including micro- and macro-vascular complications, treatment burden, social, economic, and lifestyle related factors (1). Neighborhood characteristics might be an additional risk factor for disability in diabetes.

Interest in the effects of neighborhood or local area social characteristics on health has increased in recent years due to increased attention in the social determinants of health (2). There is emerging evidence that health is a function of both individual characteristics as well as a neighborhood's aspects. Social functioning for example is not only determined by diseases- it has a developmental history and other socio-cultural determinants. A review of 25 studies found a significant association between at least one measure of social environment and a health outcome after adjusting for individual level socioeconomic status in nearly all of the studies (3). Residents of disadvantaged neighborhoods had a three-fold risk of coronary heart disease incidence compared to residents of advantaged neighborhoods, even after controlling for personal income, education, and occupation (4). Further, an area's socioeconomic status makes a substantial contribution to mortality (5).

Ecological factors are regarded as important determinants of the health and disease status of a population (6). The neighborhoods in which people live may influence health through mechanisms such as: increased prevalence of health risk behaviors such as smoking, physical inactivity, and poor diets (7); increased prevalence of stress and lack of social support (8); and individual health beliefs that relate to community norms or to social support from members of personal networks embedded within local communities (9). These shared neighborhood characteristics might influence health in addition to the impact of individual characteristics.

Few studies have explored the effects of neighborhood context on health in adults with type 2 diabetes. Insulin resistance has been was negatively associated with suitable residential environments for physical activity and for purchasing healthy foods (10) while area deprivation was found to be positively related to diabetes incidence (11). Roux et al. (12) reported an association between neighborhood characteristics and insulin resistance syndrome after controlling for personal income and education in the Coronary Artery Risk Development in Young Adults (CARDIA) Study.

To our knowledge, no previous study has examined the association between neighborhood characteristics and disability in a representative community sample of people with diabetes. The objectives of this study were to: 1. determine whether there was an association between neighborhood deprivation and self-reported disability in a community sample of people with type 2 diabetes; and 2. to ascertain whether this association remained after accounting for education, income, sociodemographic characteristics, lifestyle-related behaviors, social support, duration of diabetes, insulin treatment, diabetes specific complications and health care access problems.

RESEARCH DESIGN AND METHODS

This study is based on findings from the Montreal Diabetes Health and Well-Being Study, a random-digit-dialed telephone survey of the non-institutionalized adult population in Quebec, Canada. Participants were recruited by a recognized polling firm (Bureau d'intervieweurs professionnels, Montreal, QC) between January 2008 and April 2008 through random selection of phone numbers. The sampling frame consisted of all households with a listed telephone number in Quebec. Interviews were conducted in English and French by trained professional interviewers using a computer-assisted telephone interview system (86,486 phone calls were made, 62,439 persons were reached, 54,930 persons accepted to be interviewed, 3,221 persons were eligible for the interview, and 2,003 persons completed the interview).There were three eligibility criteria: 1) having been diagnosed as having diabetes by a physician; 2) being aged between 18 and 80 years; 3) being able to respond in either French or English. If eligible, an adult in each household with the birthday closest to the interview date was selected. Up to 6 attempts were made to conduct the interview on different days and at different times of the day. Once a randomly selected individual at a given residential telephone number was identified, up to five attempts were made to contact that individual to complete the survey. Telephone monitoring occurred throughout data collection. The average length of interview was 30 minutes. A total of 2,003 participants were interviewed, the response rate among those eligible was 62%. The protocol was approved by the Research Ethics Committee of the Douglas Mental Health University Institute, McGill University, Montreal. All subjects participated in the study voluntarily and informed consent was obtained from each participant. Participants received a $20 incentive.

Results reported in this paper are for individuals with type 2 diabetes. Participants with age at diagnosis < 30 years and insulin use immediately after diagnosis were epidemiologically classified as having type 1 diabetes and were excluded from the analysis.

Global disability was assessed using the 12-item version of the World Health Organization Disability Assessment Schedule II (WHO-DAS-II) (13), comprised of the following domains: self-care, mobility, understanding and communication, interpersonal relations, work and domestic responsibilities, and participation in community activities (two items for each domain). Sample items include "In the last 30 days, how much difficulty did you have in: -Concentrating on doing something for ten minutes? -Standing for long periods such as 30 minutes?" In each item, individuals have to estimate the magnitude of the disability during the previous 30 days from none=1 to extreme/cannot do=5. A raw score was calculated by summing the individual items. The WHO-DAS-II summary score was computed by transforming the raw score into a standardized scale of 0 to 100 with higher scores reflecting greater disability. Based on available normative data, von Korff et al.(14) classified a WHO-DAS-II score of 45 or greater as indicating substantial disability.

Distribution of the WHO-DAS-II summary score was skewed and the data were transformed by taking logarithms before conducting variance and regression analyses.

Material and ssocial deprivation was measured using the Pampalon index (15). The index is based on a microgeographic unit, namely the enumeration area. This is the smallest census unit (750 persons, on average) and is homogeneous from a socioeconomic standpoint. It was constructed through a principal component analysis integrating six census variables into two components: Material Deprivation and Social Deprivation. Each of the two components accounted for slightly more than one third of the variations in the six indicators considered, for a total of 73%. Material Deprivation is based on education, employment, and income, whereas

Social Deprivation refers to single parenting, marital status (separated, divorced, or widowed), and living alone. For each dimension, factors were grouped into quintiles of equal population size, where the first quintile represented the most privileged fifth of the Québec population and the last quintile the most deprived (disadvantaged) fifth. The two indices were linked with the survey data by postal code.

Social support was measured using the Rand Medical Outcomes Study (MOS) Social Support Survey scale (16). This scale measures four categories of functional social support: tangible support, affectionate support, positive social interaction and emotional/informational support.

Sociodemographic and socioeconomic characteristics, lifestyle-related behaviors, diabetes related variables and health care related problems were assessed by questions used in the Canadian Community Health Surveys (17).

Body-mass index (BMI) kg/m^2, was calculated based on self-reported weight and height. Subjects were asked whether they currently smoke, whether they ever smoked and to rate the number of days they exercised or participated in sports activity for at least 15 minutes in the last month. The latter was collapsed into two categories: (0 days: inactive; >0 days: active).

Duration of diabetes (years since diagnosis) and treatment of diabetes (insulin treatment versus no insulin treatment) were used as indicators for diabetes severity (18). Diabetes specific complications were assessed using the Diabetes Complications Index (DCI) (19), a 17-item survey that assesses diabetes complications on the basis of patient self-report (retinopathy, neuropathy, and large-vessel atherosclerotic disease, including coronary artery disease, peripheral vascular disease, cerebrovascular disease, and foot problems). It was designed to be analogous to the clinical assessment of the patient and incorporates questions that are similar to those that are used in the clinical encounter. Complications were categorized into three groups: no complications, one complication, two or more complications.

Health care access problems were assessed by three questions: “ Do you have a regular family doctor?”, “In the past 12 months, did you ever experience any difficulties getting specialist care you needed for a diagnosis or consultation?”, and “In the past 12 months, did you ever experience any difficulties getting the health information or advice you needed for yourself?”.

Statistical methods: All data were analyzed using SAS 9.1. Subjects with missing data on income (n=387) were omitted from the analysis. We compared the dependent and independent variables for subjects with and without reported income and found no significant difference for all variables with one exception: men were more likely to report income than women (82.7% and 76.3% respectively; $p<0.001$).

Demographic and clinical characteristics were compared using a chi-square or one-way ANOVA, as appropriate. The association between self-reported disability as measured by the WHO-DAS-II sum scores and levels of deprivation was analyzed using analysis of variance. Tests for linear trend were conducted. In a first step we compared disability for subjects living in low, medium and high deprivation areas (low deprivation: both material and social deprivation indices were in the lowest two quintiles; high deprivation: both material and social deprivation indices were in the highest two quintiles). In a second step we analyzed the association between disability and Material and Social Deprivation separately.

Linear regression analysis was conducted to control for the effect of education, household income, socio-demographic characteristics, lifestyle-related behaviors, social support, duration, insulin-treatment, complications and health care access problems. Self-reported disability was the outcome variable. Hierarchical entry was performed by entering variables in blocks in the following order: Social and Material Deprivation indices, demographic characteristics, social support and socioeconomic characteristics, lifestyle-related behaviors, health care access problems, and finally duration of diabetes, insulin use, and diabetes specific complications. Multicollinearity was assessed using the variance inflation factor (VIF). Although there is no formal cutoff value for determining the presence of multicollinearity, values of VIF exceeding 10 are often regarded as indicative of multicollinearity. All analyses were stratified for gender.

RESULTS

Out of the total of 2,003 subjects with self-reported diabetes who participated in the study, 1,868 participants had type 2 diabetes. There were 387 (20.7%) participants who did not report their income, five (0.2%) participants did not answer the WHO-DAS-II and there was missing information on the deprivation measures for 37 (2.0%) participants, resulting in a total sample size of 1439 subjects.

The mean age was 58.6 (SD=12.2) years. Women were more often widowed ($p<0.001$), had less education ($p=0.011$), had lower income ($p<0.001$), were more often never smokers ($p<0.001$), and had a higher level of disability (WHO-DAS-II scores, $p<0.001$) than men. Demographic and clinical characteristics for women and men are presented in Table 1. There was a strong association between disability and diabetes specific complications. The disability score (M (SD)) for subjects without and with one and two or more complications was 6.5 (8.8), 11.4 (13.4), and 20.5 (17.6), respectively.

There was no significant difference between women and men with respect to social support, life style related behaviors, insulin use, diabetes duration and health care access problems.

Participants living in deprived areas reported a lower level of social support, were more often smokers and were more often physically inactive.

There was a strong association between disability and Material and Social Deprivation: participants living in advantaged neighborhoods (both Material and Social Deprivation indices in the lowest two quintiles) had lower levels of disability than participants living in disadvantaged neighborhoods (both Material and Social Deprivation indices in the highest two quintiles). The mean disability scores for men were 7.8 (SD=11.8), 12.0 (SD=11.8), and 18.1 (SD=19.4) for low, medium, and high deprivation areas, respectively ($p<0.001$, ANOVA test for linear trend, log-transformed data). The mean disability scores for women were 13.4 (SD=12.4), 14.8 (SD=15.9), and 18.9 (SD=16.2) for low, medium, and high deprivation areas, respectively ($p<0.01$, ANOVA test for linear trend, log-transformed data).

A significant association between disability and neighborhood deprivation was observed when we examined Material and Social deprivation separately. Participants living in high deprivation areas had higher disability scores than those living in low deprivation areas. The mean (SD) disability scores for men were 10.1 (14.2), 10.5 (14.8), 12.6 (15.1), 13.7 (17.3) and 15.6 (17.0) for increasing quintiles of social deprivation (advantaged to disadvantaged) and 9.1 (12.7), 11.0 (15.3), 10.8 (14.1), 14.3 (17.1) and 15.8 (17.6) for increasing quintiles of material (advantaged to disadvantaged) deprivation (ANOVA test for linear trend: $p=0.002$ for material deprivation and $p<0.001$ for social deprivation, log-transformed data). The mean (SD) disability scores for women were 14.1 (15.0), 13.4 (14.3), 15.5 (16.4), 17.1 (16.6) and 17.0 (15.8) for increasing quintiles of Social Deprivation (advantaged to disadvantaged) and 15.3 (15.7), 11.9 (12.9), 16.0 (16.3), 15.8 (14.9) and 17.6 (17.3) for increasing quintiles of Material Deprivation (advantaged to disadvantaged, ANOVA test for linear trend: p=0.038 for Material Deprivation and p=0.007 for Social Deprivation, log-transformed data). The differences between the lowest and highest quintiles were smaller for women than for men and women in the second quintile reported somewhat less disability than women in the first quintile.

The results of the regression analyses are presented in Tables 2 and 3. Six hierarchical linear regression models were tested to predict the disability score. The maximum VIF was 3.1, indicating that multicollinearity was not a problem. Neighborhood Social and Material Deprivation accounted for 4% of the variance for men (2% for women). Neighborhood Material Deprivation was significantly associated with disability in all six regression models, Social Deprivation was significantly associated with disability in all models for men. Social Deprivation was no longer associated with disability for women when individual sociodemographic variables were added. The final model explained 29% of the variance for men and 34% of the variance for women. In addition to neighborhood deprivation, insulin use, complications, physical inactivity, smoking, and problems getting health information were associated with disability for men while Material Deprivation, complications, insulin use, BMI, physical inactivity, problems getting health information, problems getting specialist care and being widowed, divorced or separated were associated with disability for women.

CONCLUSIONS

In the present community based study of people with self-reported type-2 diabetes, we found an association between neighborhood deprivation and disability for both women and men. The results remained statistically significant after controlling for education, household income, socio-demographic characteristics, life style related behaviors, social support, diabetes related variables and health care related problems. Our results are consistent with other studies, which found neighborhood effects on general health status, mortality, or cardiovascular outcomes. The present study adds to this literature evidence for an independent effect of neighborhood context on disability in people with diabetes in addition to individual socioeconomic status and individual lifestyle-related behaviors. To our knowledge this study is the first to analyze the association between disability and neighborhood deprivation in a large community sample of people with diabetes.

The strengths of the study include the population-based design, the assessment of disability rather than general health status, the inclusion of microgeographic units, and the inclusion of a broad spectrum of risk factors for disability. The study also has limitations. We have used administratively defined census enumeration areas for the assessment of deprivation. It is possible that these boundaries do not represent neighborhoods as defined by the residents living within them. In addition, the deprivation indices are based on the 2001 Canadian census. It is possible that neighborhood environment has changed in recent years. We have not examined the proportion of immigrants and different ethnic groups and we were unable to examine how long people have been exposed to their neighborhood environments. We have used a brief, generic disability score as outcome measure. Disability is a complex, multi-dimensional phenomenon and a global score might obscure domain-specific differences in disability. The low response rate may have resulted in some bias due to systematic differences between respondents and non-respondents. Unfortunately, we have no data on non-respondents in the present study. Although we did not address neighborhood characteristics during the interview, it is possible that people responded differently depending on their neighborhood characteristics (information bias). Finally, this is a cross-sectional analysis, thus, no causal inferences should be made.

Neighborhood environment has been linked to health behaviors in many studies (20) and may contribute to the development and persistence of established risk factors. Neighborhoods differ in exposure to negative health messages and access to healthy food. For example, studies have found evidence of tobacco industry targeting of outdoor advertising in low-income areas (21). Franco et al. (22) reported less availability of healthy foods in lower income neighborhoods. Differences among neighborhoods in the physical environment -for example, a lack of recreational facilities and safe places to exercise- may affect patterns of physical activity (23). Further, neighborhoods may have different social norms about the acceptability of certain health behaviors (smoking habits, diet, and physical activity) which in turn might affect health (9).

Living in disadvantaged neighborhoods may be associated with exposure to sources of chronic stress (such as noise, violence, and poverty), which may be linked to poor health status (8). Finally, social capital defined as the presence (or absence) of social networks associated with civic participation, educational attainment, and cooperation among citizens (20), may influence health through psychosocial processes like social support. Neighbors that trust one another are more likely to provide help and support in time of need (24).

The association between material and social deprivation and disability was somewhat different for women and men. Women had a higher level of disability than men, and the difference in disability scores between those living in advantaged neighborhoods (quintile 1) and those living in disadvantaged neighborhoods (quintile 5) was smaller for women than for men. A similar association was observed between smoking and physical activity and neighborhood deprivation: men living in advantaged (social) neighborhood were less often smokers (17.8%) and more often physically active (79.2%) than women (22.3% and 70.3%, respectively). It is possible that the neighborhood environment might have a differential effect on health related behavior for women and men and such that woman respond differently to their social environment.

The assessment of neighborhood characteristics may capture factors that are not identified by individual risk factors. Environmental factors may interact with individual-level factors in a dynamic way to influence health. A neighborhood possesses characteristics that are distinct from the summation of the characteristics of the individuals living in this neighborhood (20). Neighborhoods and their residents reciprocally/mutually influence one another. People are embedded in social networks and are influenced by the evident appearance and behaviors of those surrounding them (25).

The inclusion of neighborhood characteristics might be an important step in the identification and interpretation of risk factors for disability in diabetes. The promotion of physical activity and a healthy lifestyle should incorporate environmental factors that can encourage behavior change. Without considering social and physical environment (lack of facilities, traffic) such advice is unlikely to produce behavior change.

In conclusion, our results provide important evidence of neighborhood deprivation influences on disability in people with diabetes. The public health significance is consequential due to the increasing number of people with diabetes and the high level of disability. To enhance our understanding of neighborhood contextual effects, further studies are needed to elucidate the mechanisms through which neighborhood-level deprivation influences behaviors.

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Table 1: Demographic and clinical characteristics of study participants

	Men (n=681)				Women (n=758)			
	Material & Social Deprivation				Material & Social Deprivation			
	Low (n=95)	Medium (n=469)	High (n=117)	p value*	Low (n=78)	Medium (n=506)	High (n=174)	p value*
Demographic variables								
Age, M (SD)	59.7 (10.9)	59.9 (10.7)	59.3 (11.1)	0.885	57.7 (11.6)	59.6 (11.6)	61.2 (11.0)	0.070
Marital status: single, %	3.1	12.5	21.3	<0.001	6.5	11.7	16.6	<0.001
married, %	80.9	71.5	57.3		58.9	56.5	36.8	
widow./divorc./separ., %	16.0	16.0	21.4		34.6	31.8	46.6	
Ethnicity: white, %	86.3	93.5	87.8	0.023	87.0	94.6	91.3	0.031
Social support, M (SD)	71.0 (25.4)	64.0 (27.0)	59.8 (30.5)	0.006	68.5 (26.0)	66.3 (25.2)	57.6 (26.1)	0.036
Socioeconomic variables								
Education: < high school , %	27.7	40.9	47.8	0.034	37.7	46.6	56.7	0.014
high school , %	34.0	27.3	28.7		26.0	26.2	25.4	
> high school , %	38.3	31.8	23.5		36.3	27.2	17.9	
Household income: <$50,000, %	40.0	62.9	75.2	<0.001	44.9	76.9	88.5	<0.001
$50,000-$80,000, %	24.2	18.6	16.2		23.1	13.0	6.9	
>$80,000, %	35.8	18.5	8.6		32.0	10.1	4.6	
Lifestyle related behaviors								
Smoking: current, %	12.6	19.4	36.2	<0.001	23.4	20.6	27.0	0.115
former, %	47.4	53.9	42.2		24.7	36.7	31.0	
Physically inactive, %	16.0	28.5	37.9	0.002	30.1	30.8	39.3	0.113
BMI, M (SD) , %	29.8 (8.2)	30.4 (7.3)	29.5 (6.5)	0.475	29.7 (6.7)	30.5 (7.6)	31.8 (10.7)	0.133
Health care access problems								
Has a regular family doctor, %	91.6	94.9	90.6	0.154	91.0	94.7	94.8	0.411
Difficulties getting specialist care, %	17.9	23.5	18.0	0.269	22.0	26.2	16.1	0.023
Difficulties getting information/advice, %	6.3	5.3	7.7	0.612	10.4	6.5	8.1	0.434
Diabetes related variables								
Diabetes duration (years), M (SD)	10.3 (9.4)	11.4 (11.0)	10.4 (10.4)	0.519	8.0 (8.2)	10.6 (10.4)	13.7 (13.6)	<0.001
Insulin use, %	23.2	25.2	19.8	0.467	14.1	23.4	28.3	0.048
Diabetes specific complications 0, %	40.8	31.6	29.6	0.004	34.3	30.6	23.9	0.215
1, %	29.6	30.1	16.3		23.3	30.0	27.7	
> 1, %	29.6	38.3	54.1		42.4	39.4	48.4	

* *P* values refer to comparison between those living in low, medium, and high social & material deprivation areas.
+ *P* values refer to comparison between men and women living in low, medium, and high social & material deprivation areas
Note. Scores of the social support scale were transformed linearly to 0-100 scale, where 0 and 100 are assigned to the lowest and highest possible scores, respectively.

Table 2: Association between social and material deprivation and disability for men

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
R^2	0.04	0.06	0.09	0.15	0.16	0.29
Social deprivation	**0.14‡**	**0.12†**	**0.13†**	**0.12†**	**0.12†**	**0.09***
Material deprivation	**0.16‡**	**0.16‡**	**0.13†**	**0.10***	**0.11***	**0.08***
Demographic variables						
Age		0.03	-0.01	0.01	0.01	-0.03
Marital status -married		-0.08	-0.09	-0.05	-0.04	-0.04
Marital status –widowed/divorced/separated		0.03	0.03	0.03	0.04	0.05
Ethnicity-white		0.02	0.02	-0.01	-0.01	-0.02
Social support			-0.06	-0.07	-0.05	-0.07
Socioeconomic variables						
Education: < high school			0.13†	0.10*	0.11*	0.07
Education: high school			0.03	0.01	0.01	0.01
Household income			-0.05	-0.03	-0.01	-0.03
Lifestyle related behaviors						
Smoking: current				0.13*	0.12*	0.09*
Smoking: former				0.09*	0.09*	0.08
Physically inactive				0.20‡	0.20‡	0.16‡
BMI				0.05	0.05	0.07
Health care access problems						
Has a regular family doctor					0.02	0.07
Difficulties getting specialist care					0.05	-0.03
Difficulties getting information or advice					0.10*	0.14‡
Diabetes related variables						
Diabetes duration						0.08
Insulin use						0.12†
Number of diabetes specific complications						0.31‡

Data are standardized regression coefficients (β).

* $P < 0.05$;

† $P < 0.01$;

‡ $P < 0.001$;

Note. Disability was assessed by the WHO-DAS-II and the summary score (log-transformed) was entered as dependent variable. High level of the social support variables indicates good social support. Marital status, education, smoking, physical inactivity, insulin use, and health care related problems variables were entered as dichotomous variables (1=yes, 0=no).

Table 3: Association between social and material deprivation and disability for women

Material deprivation	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
R^2	0.02	0.07	0.09	0.18	0.21	0.34
Social deprivation	**0.09****	**0.04**	**0.05**	**0.04**	**0.05**	**0.04**
Material deprivation	**0.08****	**0.08****	**0.08****	**0.08****	**0.08****	**0.08****
Demographic variables						
Age		-0.01	-0.01	0.01	-0.04	-0.03
Marital status -married		-0.21†	-0.22‡	-0.15*	-0.13	-0.04
Marital status –widowed/divorced/separated		0.03	0.05	0.08	0.08	0.16†
Ethnicity-white		-0.01	0.03	0.03	0.04	0.05
Social support			-0.04	-0.06	-0.04	-0.04
Socioeconomic variables						
Education: < high school			0.03	-0.01	0.02	-0.03
Education: high school			-0.04	-0.08	-0.06	-0.08
Household income			-0.10*	-0.06	-0.03	-0.03
Lifestyle related behaviors						
Smoking: current				0.07	0.06	0.05
Smoking: former				0.03	0.04	0.01
Physically inactive				0.23‡	0.24‡	0.19‡
BMI				0.14‡	0.15‡	0.15‡
Health care access problems						
Has a regular family doctor					-0.02	-0.02
Difficulties getting specialist care					0.15‡	0.11†
Difficulties getting information or advice					0.09*	0.09*
Diabetes related variables						
Diabetes duration						0.02
Insulin use						0.09*
Number of diabetes specific complications						0.33‡

Data are standardized regression coefficients (β)
* $P < 0.05$;
† $P < 0.01$;
‡ $P < 0.001$;

Note. Disability was assessed by the WHO-DAS-II and the summary score (log-transformed) was entered as dependent variable. High level of the social support variables indicates good social support. Marital status, education, smoking, physical inactivity, insulin use, and health care related problems variables were entered as dichotomous variables (1=yes, 0=no).