DIABETES TYPE 2 IN BELGIAN WOMEN OF TURKISH AND MOROCCAN ORIGIN: AN IMPORTANT HEALTH ISSUE

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ABSTRACT

The first aim of this study is to report the diabetes prevalence among a representative sample of 35- to 74-year-old Belgian adults of Turkish and Moroccan origin and to compare this prevalence rate to that of native Belgians of the same age. The second objective is to examine the determinants and specific mechanisms responsible for differences in diabetes between these communities.

Based on the Health Interview Surveys of 1997, 2001 and 2004, we found a higher diabetes prevalence in the Turkish and Moroccan communities in Belgium. In men, 'ethnic' differences in the prevalence of diabetes are explained by the variables 'lack of physical activity' and 'educational attainment'. In women, 'ethnic' differences remain significant, but become smaller after accounting for 'BMI' and 'educational attainment'. In both men and women, the influence of educational level on the prevalence of diabetes is partially mediated by the lifestyle factors 'BMI' and 'lack of physical activity'. In the discussion, the results are put in a broader framework and several tracks for policy and research action are presented.

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INTRODUCTION

One of the major health problems in the Turkish and Moroccan communities in Belgium is diabetes type 2[3]. 'Ethnic' differences in diabetes prevalence are found in many countries (5-13). Clinical practice (14-15) and research (16) both strongly indicate a higher prevalence of diabetes in Belgians of Turkish and Moroccan origin. Moreover, Deboosere and Gadeyne (17) found an excess mortality rate from diabetes mellitus among Moroccan women living in Belgium (25 to 54 years old). Dutch research (10-13) also shows a higher prevalence of diabetes type 2 in persons of Turkish, Moroccan and Surinam origin than in native Dutch people.

Only a few Belgian studies have been published on the determinants and specific mechanisms responsible for the higher diabetes prevalence among Belgians of Turkish and Moroccan origin (16). In the Netherlands, however, some authors (10-13) did examine risk factors responsible for the higher diabetes prevalence among persons of Turkish, Moroccan and Surinam origin. They give diverging explanations: biological, cultural as well as socio-economic differences are hypothesized to account for the higher diabetes prevalence in these communities. With regard to the biological factors, three hypotheses are distinguished: the 'thrifty genotype', the 'genetically unknown food' and the 'thrifty phenotype' hypothesis (6, 13, 18). Next to the biological explanations put forward by some authors, others mainly attribute the higher diabetes prevalence among migrant communities to lifestyle patterns and socio-economic factors (5, 10-13, 16, 19). The most commonly cited associated lifestyle patterns are diet – the composition of the diet as well as an excessively high total caloric intake –, excess weight/obesity and physical activity. All of these lifestyle patterns are not only strongly culturally related; they also have a strong socio-economic component (20). Thus, next to the biological and lifestyle factors, socio-economic determinants also play an important part in differences in diabetes prevalence (3, 16, 19). Diabetes mellitus is – like health and illness in a broader sense – a social phenomenon. Diabetes contributes to the process of surviving and dying and is an outcome of a large and diverse set of risk factors during lifetime. Research by Kriegsman et al. (10) shows that a higher socio-economic status is associated with a lower risk of diabetes mellitus type 2, regardless of 'ethnic' origin. Moreover, Dijkshoorn, Uitenbroek and Middelkoop (11) report a lower educational level as an important risk factor in the higher diabetes prevalence among the Turkish and Moroccan communities in the Netherlands. In this study, we will focus on the contribution of lifestyle factors and socio-economic determinants in the observed differences in diabetes morbidity[4].

RESEARCH QUESTIONS

In this case study, two central research questions are addressed. The first one runs as follows: is the diabetes prevalence higher among 35- to 74-year-old Belgians of Turkish and Moroccan origin than among native Belgians of the same age and if so, to what extent is this prevalence higher? The

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[3] Diabetes type 2 is a severe metabolic disorder, of which the main characteristics are: a decreased glucose tolerance and an increased blood sugar level (glycemia) with glucose in the urine (glycosuria). This insulin resistant form of diabetes occurs predominantly at an advanced age (over 40 years old). Diabetes mellitus is also an incurable disease, accompanied with an increased death probability. There is strong evidence that genetics play an important part in interaction with environmental factors (1-4).

[4] On the basis of the data, which we had at our disposal (the Health Interview Surveys of 1997, 2001 and 2004), we couldn't examine the biological explanations presented above. Therefore, we restricted our analyses to the possible influence of lifestyle patterns and socio-economic determinants on ethnic differences in the prevalence of diabetes.

second research question is: do lifestyle factors – in particular excess weight/obesity and lack of physical activity[5] – and socio-economic determinants – educational attainment and income – contribute to the observed differences in diabetes morbidity?

Based on the presented summary of the literature, we hypothesize that the prevalence of diabetes is relatively high in adults of Turkish and Moroccan origin compared to native Belgians. Moreover, we expect that both lifestyle factors and socio-economic determinants are associated with this relatively high diabetes prevalence in the Turkish and Moroccan communities in Belgium.

The model underlying these analyses is that differences in the prevalence of diabetes between the Belgian, Turkish and Moroccan communities in Belgium can be partially explained by socio-economic and lifestyle differences between these communities. However, the influence of socio-economic determinants on diabetes is not direct, but mediated by other factors. In this study, we examine if the influence of socio-economic factors on diabetes prevalence is mediated by lifestyle factors. We remark that, although the data at our disposal (the Belgian Health Interview Surveys) are cross sectional, the (causal) direction of the association between diabetes mellitus type 2 and socio-economic factors can logically be deduced. For example, as diabetes type 2 occurs predominantly at an advanced age, educational attainment precedes this type of diabetes and the relation goes thus from educational level to diabetes type 2 (21).

DATA

Both research questions will be examined using the Belgian Health Interview Surveys of 1997, 2001 and 2004 (HIS 97-01-04). These Surveys were carried out by the Epidemiology Unit of the Scientific Institute of Public Health. The main objective of these surveys is to give a description of the health status of the population residing in Belgium. For that purpose, a wide range of health related issues has been considered, covering five main domains: health status, health determinants, medical prevention, health consumption and health and society. The research group Interface Demography pooled the Surveys in order to obtain sufficient high numbers of Belgians of Turkish and Moroccan origin. The total population of age 35 to 74 included in the analyses accounts for 17.981 persons (Turkish origin N=169; Moroccan origin N=495) (22-24).

METHOD

In order to better understand the diabetes prevalence in the age group of 35- to 74-year-olds and to estimate the impact of 'ethnicity', socio-economic determinants and lifestyle factors upon the prevalence of diabetes, we conducted stepwise logistic regression analyses with diabetes prevalence as the dependent variable. Statistical analyses were executed by means of the SPSS 15.0 software.

[5] We took diet, albeit an important lifestyle factor with relation to differences in diabetes prevalence, only indirectly into account by excess weight/obesity, as the indicators constructed using the Belgian Health Interview Surveys of 1997, 2001 and 2004 appeared inadequate.

OPERATIONAL DEFINITION OF THE VARIABLES

- *Diabetes type 2*

  To mark out diabetes type 2, we selected the age group of 35-year-olds and older. In this way, we exclude diabetes type 1 at younger ages. This is a relatively crude, but nonetheless effective way of focussing on diabetes type 2, particularly because the proportion of diabetes type 2 in the total diabetes prevalence is estimated at 90 %.

  An important remark is that it concerns self-reported diabetes. This self-reportage leads to an underestimation of the actual diabetes prevalence, since one third to half of all diabetics are unaware of the fact that they suffer from diabetes.

- *'Ethnic' origin*

  To get the largest possible number of Belgians of Turkish and Moroccan origin in the sample, we used a criterion that maximizes their proportion. Each member of a household, where one person had the Turkish (Moroccan) nationality or was born in Turkey (Morocco), was considered as being of Turkish (Moroccan) origin. Respondents, who lived in a household where no one had the Turkish (Moroccan) nationality or was born in Turkey (Morocco), were assumed to be native Belgians. In the age group of 35- to 74-year-olds, this means *de facto* that respondents with both the Belgian nationality and Belgium as country of birth were considered as native Belgians.

- *Age*

  We used the variable 'age in years', since the prevalence of diabetes changes continuously with age in the group studied (35- to 74-year-olds). We also 'centered' age, by extracting 35, so that the intercept would have a more meaningful interpretation. An important remark is that, by pooling the three Belgian Health Interview Surveys, we bring different birth cohorts together.

- *Socio-economic determinants*
  - *Educational attainment*

    For the variable 'educational attainment', we used the ISCED-classification. This categorical variable can acquire the following modalities: no diploma / primary education *(1)*; lower secondary education / special secondary education *(2)*; higher secondary education *(3)*; higher education *(4)*. With regard to diabetes type 2 in the age group of 35- to 74-year-olds, there is an 'educational gradient'. Persons with a lower educational level have a greater risk of diabetes than persons with a higher educational attainment.

  - *Income*

    The variable '(equivalent) income' consists of the following categories: less than 750 euros *(1)*; 750 to 1,000 euros *(2)*; 1,000 to 1,500 euros *(3)*; 1,500 to 2,500 euros *(4)*; more than 2,500 euros *(5)*. To calculate this variable the modified OECD-scale was used (25). Here again, socio-economic differences in diabetes prevalence were found.

- *Lifestyle factors*
  - *Excess weight/obesity*

    We used the variable 'body mass index' (BMI) as an operational definition of the concept 'excess weight / obesity'. In order for the intercept to have a more meaningful interpretation, this variable was centered ('BMI – 25.77')[6].

  - *Physical activity*

    We measured the concept of 'physical activity' by the variable 'lack of (leisure time) physical activity'. This is a dummy variable with the categories: weekly physically active *(0)* and sedentary *(1)*[7].

RESULTS

DIABETES PREVALENCE

As expected, figure 1 shows that the prevalence of diabetes in our sample increases with age. At age 25, the risk of diabetes in native Belgians is 0.006. In 25-year-old Belgians of Turkish origin, the risk of diabetes is 0.023. In Belgians of Moroccan origin of the same age, the risk of diabetes amounts to 0.017. At age 70, the mean diabetes probability has increased to 0.122, 0.362 and 0.297 in native Belgians, Belgians of Turkish origin and Belgians of Moroccan origin respectively (1, 4). The diabetes prevalence is higher at all ages in Belgians of Turkish and Moroccan origin than in native Belgians (10-11; 16; 30-31). Finally, figure 1 reveals that diabetes type 2 has an earlier onset in the Turkish and Moroccan communities in Belgium. Kriegsman et al. (10) also report a difference in mean age between the patients in their inquiry. Dutch patients were older than Turkish and Moroccan patients. According to Baschetti (18) and Østbye et al. (32), diabetes type 2 occurs at an earlier age in newly westernized populations.

[6] A limitation of the variable 'body mass index' is that it is based on reported height and weight and therefore less reliable compared to measured data (26-27). The use of self-reported data results in an underestimation of BMI (27). A second limitation of our data is the use of body mass index as the sole criterion of excess weight. According to a number of studies (1, 4, 28), abdominal obesity is, apart from overall excess weight, an independent risk factor in diabetes type 2.

[7] A restriction of this indicator is that it does not take physical exercise during professional activity into account. As a consequence, it is strongly socio-economically related. Persons with a lower education more often have sedentary leisure activities. A second limitation of the variable 'lack of (leisure time) physical activity' is that it is culturally related. In the Turkish and Moroccan culture, there is no tradition of leisure time physical activity, especially not for women (29).

Figure 1: Diabetes prevalence as a function of age and 'ethnic' origin

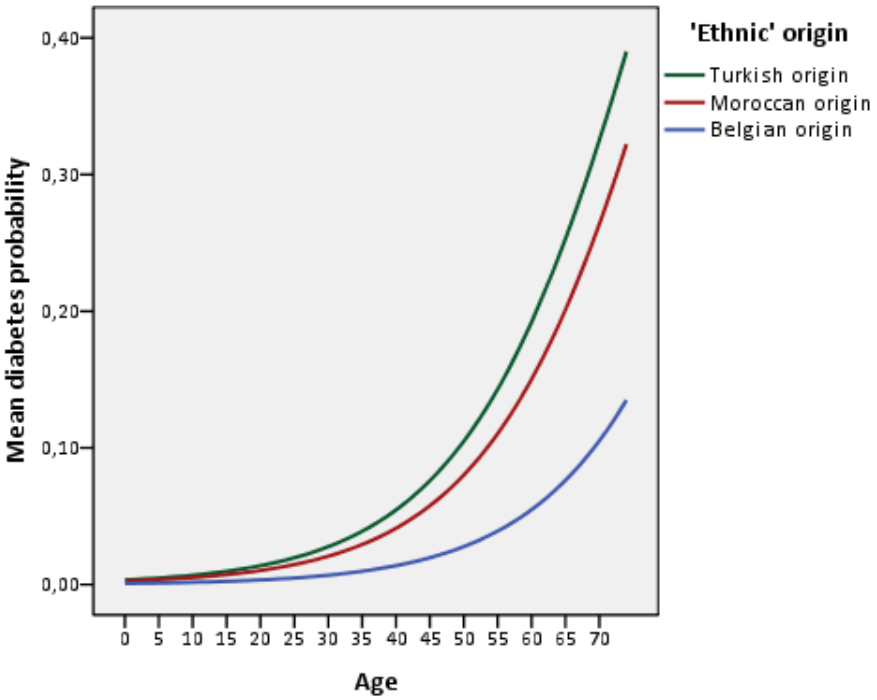

Table 1 gives an overview of the results of the logistic regression analyses of the prevalence of diabetes by age, sex and 'ethnic' origin (age group of 35- to 74-year-olds).

Models 1 and 2 are additive models. Model 1 shows us that the odds of diabetes are multiplied by a factor 1.065 with each year people get older. As appears from model 2, women have a lower risk of diabetes, but the difference in the prevalence of diabetes between men and women is not significant in this model. Another finding is that Belgians of Turkish and Moroccan origin have a higher risk of diabetes type 2. The odds ratio for Turkish versus Belgian subjects amounts to 4.573. For Moroccan subjects, the odds ratio$_{\text{Moroccan-Belgian}}$ is 3.106.

In model 3, we included the interaction term 'ethnic origin*sex'. The inclusion of this interaction term leads to a significant improvement of the model fit. As appears from the parameter estimates of model 3, in native Belgians the mean diabetes probability is lower in women than in men. In the Turkish and Moroccan communities on the other hand, women are at a higher risk. In men as well as in women, the risk of diabetes type 2 is higher in the Turkish and Moroccan communities than in the Belgian community, but the differences are more pronounced in women. In the age group of 35- to 74-year-olds, the prevalence of diabetes type 2 amounts to 5.0 % in native Belgian men. In 35- to 74-year-old men of Turkish and Moroccan origin, the diabetes prevalence is 5.8 % and 6.5 % respectively. In the same age group, the prevalence of diabetes in women of Belgian origin is 4.3 %. In the Turkish and Moroccan communities in Belgium, women are at a higher risk (18.7 % and 11.9 % respectively).

Table 1: Model estimates of diabetes prevalence by age, sex, 'ethnic' origin and the interaction effect 'ethnic origin*sex' (men and women jointly)

		Model								
		Model 1			*Model 2*			*Model 3*		
Variables	Categories	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.
Intercept		0.013	0.097	***	0.012	0.107	***	0.012	0.107	***
Age - 35		1.065	0.004	***	1.069	0.004	***	1.069	0.004	***
Sex	Man (ref.)				1.000			1.000		
	Woman				0.881	0.076	*n.s.*	0.818	0.079	*
'Ethnic' origin	Belgian (ref.)				1.000			1.000		
	Turkish				4.573	0.265	***	1.702	0.526	*n.s.*
	Moroccan				3.106	0.179	***	1.978	0.278	*
'Ethnic' origin*sex	Turkish*woman							5.102	0.615	**
	Moroccan*woman							2.393	0.362	*
	Deviance	5,640.207			5,583.089			5,569.258		
	$D\chi^2$		350.488	***		57.118	***		13.831	***
	Df			1			3			2
	AIC	5,642.207			5,593.089			5,583.258		
	BIC	5,659.516			5,631.360			5,636.838		
	N		15,588			15,588			15,588	

Significance: *** p < 0.001; ** p < 0.01; * p < 0.05; n.s.: not significant

RISK FACTORS

As stated above, based on HIS 97-01-04 we found a higher diabetes prevalence among adults of the Turkish and Moroccan communities in Belgium than among adults of the Belgian community. In this section, we examine explanations that attribute the higher diabetes prevalence among recently westernized populations to socio-economic factors and lifestyle patterns. Analyses are presented for men and women separately, as risk factors are strongly gender related (20).

Socio-economic determinants

First, we examine to what extent educational attainment and income can explain the 'ethnic' differences in diabetes prevalence.

Educational attainment

Table 2 and 3 give an overview of the diabetes prevalence by age, 'ethnic' origin and socio-economic determinants for men and women respectively. In both men and women, there are 'ethnic' differences in diabetes prevalence, although the 'ethnic' differences in the prevalence of diabetes type 2 are smaller in men (table 2 and 3, model 1). The odds ratio for Turkish versus Belgian men is 1.714. For Moroccan versus Belgian men, the odds ratio amounts to 1.990. For Turkish versus Belgian women and Moroccan versus Belgian women, the odds ratios are 8.608 and 4.696 respectively.

Accounting for educational attainment, the 'ethnic' differences in the prevalence of diabetes in both men and women become smaller (table 2 and 3, model 2). A lower educational level is thus associated with the higher diabetes prevalence in Belgians of Turkish and Moroccan origin. People with a lower educational level have a greater risk of diabetes type 2. This socio-economic gradient in the prevalence of diabetes is stronger in women than in men. This finding is in keeping with our expectations. Beck, Vanroelen and Louckx (20) also report – based on HIS 97 – a steeper socio-economic gradient in chronic morbidity in women, compared to men.

Table 2: Model estimates of diabetes prevalence by age, 'ethnic' origin and socio-economic determinants (men)

		Model								
		Model 1			*Model 2*			*Model 3*		
Variables	Categories	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.
Intercept		0.012	0.140	***	0.015	0.184	***	0.015	0.228	***
Age - 35		1.070	0.005	***	1.067	0.005	***	1.068	0.006	***
'Ethnic' origin	Belgian (ref.)	1.000			1.000			1.000		
	Turkish	1.714	0.527	*n.s.*	1.536	0.532	*n.s.*	1.788	0.533	*n.s.*
	Moroccan	1.990	0.279	*	1.840	0.284	*	1.808	0.301	*
Socio-economic factors										
Educational attainment	No diploma/prim. ed. (ref.)				1.000					
	Lower sec. ed.				1.061	0.146	*n.s.*			
	Higher sec. ed.				0.778	0.152	*n.s.*			
	Higher ed.				0.716	0.159	*			
Income	Less than 750 euros							1.068	0.249	*n.s.*
	750 to 1,000 euros (ref.)							1.000		
	1,000 to 1,500 euros							0.861	0.188	*n.s.*
	1,500 to 2,500 euros							0.774	0.187	*n.s.*
	More than 2,500 euros							0.733	0.217	*n.s.*
	Deviance	2,820.730			2,811.812			2,531.701		
	$D\chi^2$ [a]		199.773	***		208.691	***		189.429	***
	Df			3			6			7
	AIC	2,828.730			2,825.812			2,547.701		
	BIC	2,856.489			2,874.391			2,602.274		
	N			7,630			7,630			6,779

[a] Deviances are always compared to the respective intercept model Significance: *** p < 0.001; ** p < 0.01; * p < 0.05; n.s.: not significant

Income

Accounting for income, in men as well as in women, the 'ethnic' differences in diabetes prevalence remain almost unaltered (table 2 and 3, model 3). Moreover, in men, income has no significant effect on the prevalence of diabetes (controlling for age). In women, diabetes type 2 differs significantly according to income (controlling for age), but the risk of diabetes differs only significantly in the last income category from the diabetes probability in people with an income of 750 to 1,000 euros. The 'income gradient' – the increased risk of diabetes as income decreases (cf. supra) – is thus strongly related to the higher mean age in the lower income categories.

However, this does not mean that income isn't an important socio-economic determinant in the prevalence of diabetes. Moreover, the relation between income and diabetes is probably more

complex and differs according to 'ethnic' origin. In 35- to 74-year-old native Belgian men, a lower income is associated with a higher prevalence of diabetes type 2[8]. In Belgian men of Turkish and Moroccan origin, we found no statistically significant association between income and diabetes prevalence[9]. In native Belgian women as well as in Belgian women of Moroccan descent, a lower income is associated with a higher prevalence of diabetes type 2[10]. In Belgian women of Turkish origin, we found no statistically significant association between income and diabetes prevalence[11]. However, as in Belgian men of Turkish and Moroccan origin, it is difficult to draw conclusions from the association between income and diabetes prevalence in Belgian women of Turkish and Moroccan origin, because the expected counts in the cells of the crosstabs are very low. Therefore, we excluded the variable 'income' from further analyses.

However, we might get a better notion of the relation between income and diabetes type 2 by looking at another relation, namely the association between income and body mass index. It might be hypothesized that the relation between income and diabetes type 2 may resemble the association between income and BMI.

In 35- to 74-year-old Belgian men, the rank correlations between income and BMI are slightly negative[12]. In men of Turkish and Moroccan descent on the other hand, rank correlations are positive[13]. As in Belgian men, the rank correlations between income and body mass index are negative in 35- to 74-year-old Belgian women[14]. In women of Moroccan origin, Kendall's τ and Spearman's ρ indicate a negative association between income and BMI[15]. In women of Turkish origin on the other hand, the rank correlations are not significant[16]. In the discussion, we shed light on some possible explanations for these diversified findings.

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[8] $\chi^2 = 38.982$ ($p < 0.001$).

[9] $\chi^2_{\text{Turkish origin}} = 2.828$ ($p = 0.587$) and $\chi^2_{\text{Moroccan origin}} = 8.347$ ($p = 0.080$). These results are, however, not 'robust', as more than 20 % of the crosstab cells have expected counts less than 5.

[10] $\chi^2_{\text{Belgian origin}} = 48.807$ ($p < 0.001$) and $\chi^2_{\text{Moroccan origin}} = 9.942$ ($p < 0.05$).

[11] $\chi^2 = 2.426$ ($p = 0.656$).

[12] Kendall's $\tau = 0.020$ ($p < 0.05$) and Spearman's $\rho = -0.027$, $p < 0.05$.

[13] Kendall's $\tau_{\text{Turkish origin}} = 0.199$ ($p < 0.05$) and Spearman's $\rho_{\text{Turkish origin}} = 0.266$ ($p < 0.05$). Kendall's $\tau_{\text{Moroccan origin}} = 0.151$ ($p < 0.05$) and Spearman's $\rho_{\text{Moroccan origin}} = 0.195$ ($p < 0.05$).

[14] Kendall's $\tau = -0.116$ ($p < 0.01$) and Spearman's $\rho = -0.156$ ($p < 0.01$).

[15] Kendall's $\tau = -0.123$ ($p < 0.05$) and Spearman's $\rho = -0.159$ ($p < 0.05$).

[16] Kendall's $\tau = 0.042$ ($p = 0.666$) and Spearman's $\rho = 0.068$ ($p = 0.599$).

Table 3: Model estimates of diabetes prevalence by age, 'ethnic' origin and socio-economic determinants (women)

		Model								
		Model 1			*Model 2*			*Model 3*		
Variables	Categories	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.
Intercept		0.010	0.146	***	0.018	0.184	***	0.014	0.221	***
Age - 35		1.068	0.005	***	1.058	0.005	***	1.061	0.006	***
'Ethnic' origin	Belgian (ref.)	1.000			1.000			1.000		
	Turkish	8.608	0.322	***	6.007	0.328	***	7.826	0.334	***
	Moroccan	4.696	0.235	***	3.497	0.243	***	4.687	0.239	***
Socio-economic factors										
Educational attainment	No diploma/prim. ed. (ref.)				1.000					
	Lower sec. ed.				0.761	0.139	*			
	Higher sec. ed.				0.657	0.153	**			
	Higher ed.				0.321	0.208	***			
Income	Less than 750 euros							0.895	0.223	*n.s.*
	750 to 1,000 euros (ref.)							1.000		
	1,000 to 1,500 euros							0.982	0.173	*n.s.*
	1,500 to 2,500 euros							0.885	0.176	*n.s.*
	More than 2,500 euros							0.517	0.243	**
	Deviance	2,748.458			2,712.155			2,471.748		
	$D\chi^2$ [a]		220.493	***		256.795	***		209.292	***
	Df			3			6			7
	AIC	2,756.458			2,726.155			2,487.748		
	BIC	2,784.386			2,775.029			2,542.610		
	N			7,958			7,958			7,029

[a] Deviances are always compared to the respective intercept model

Significance: *** p < 0.001; ** p < 0.01; * p < 0.05; n.s.: not significant

Lifestyle factors

Next to socio-economic determinants, lifestyle plays an important part in the development of diabetes type 2. In this study, we explore if the lifestyle factors 'excess weight/obesity' and 'lack of physical activity' contribute to community differences in the prevalence of diabetes.

Excess weight/obesity

In table 4 and 5, we can see that the 'ethnic' differences in the prevalence of diabetes remain, accounting for body mass index (model 1). In men, the 'ethnic' differences in the prevalence of diabetes stay approximately the same, accounting for BMI. For Moroccan men, BMI cannot explain their higher diabetes risk compared to Belgian men, as they have a smaller body mass index than Belgian men. Consequently, the odds ratio of Moroccan versus Belgian men becomes a bit larger, controlling for BMI (table 2, model 1 and table 4, model 1)[17]. In women, the differences in the prevalence of diabetes between the different communities get smaller, accounting for body mass

[17] Belgian men have a BMI of 26.332. Turkish and Moroccan men have a body mass index of 26.368 and 26.060 respectively.

index (table 3, model 1 and table 5, model 1). The higher diabetes prevalence in women of Turkish and Moroccan origin is thus associated with their higher mean body mass index[18].

In men as well as in women, the risk of diabetes increases with body mass index, but the effect of BMI on diabetes type 2 is stronger in women. This sex differential effect remains, when 'ethnic' origin is not taken into account. We have no satisfying explanation for the stronger effect of BMI in women, but possibly, different metabolic processes are at work in males and females.

Lack of physical activity

Model 2 (table 4) shows us that the 'ethnic' differences in the prevalence of diabetes are no longer significant in men, when the variable 'lack of (leisure time) physical activity' is included in the analyses, although the odds ratio for Moroccan versus Belgian men remains rather high. However, the higher risk of diabetes type 2 in men of Turkish and Moroccan origin is associated with their more sedentary leisure lifestyle. In women, the differences in the diabetes prevalence between the 'ethnic' communities in Belgium remain significant, after accounting for 'lack of physical activity'. The odds ratio for Turkish versus Belgian women becomes even larger (table 3, model 1 and table 5, model 2). The more sedentary leisure lifestyle of Turkish women does not explain their higher risk of diabetes compared to Belgian women. In line with our expectations, the odds ratio for Moroccan versus Belgian women becomes smaller (table 3, model 1 and table 5, model 2).

In both men and women, the risk of diabetes type 2 is generally higher in people with sedentary leisure activities than in people who are weekly physically active. As with body mass index, the effect of the variable 'lack of physical activity' on the prevalence of diabetes is stronger in women. This sex differential effect also remains, when 'ethnic' origin is not taken into account.

Excess weight/obesity and lack of physical activity

As mentioned above, the 'ethnic' differences in the prevalence of diabetes in men are no longer significant, when the variable 'lack of (leisure time) physical activity' is included (table 4, model 2). Inserting both lifestyle factors – body mass index and lack of physical activity – (table 4, model 3), the community differences in the prevalence of diabetes in men remain insignificant. The effects of BMI and lack of leisure time physical activity on the diabetes prevalence in men become a bit smaller as there is a weak positive correlation between these variables, but they remain significant.

In women, the 'ethnic' differences in diabetes prevalence persist, accounting for both lifestyle factors (table 5, model 3). Moreover, as in men, the effects of body mass index and lack of physical activity on diabetes type 2 remain significant, but become a bit smaller as there is a weak positive correlation between these variables.

Lifestyle factors and educational attainment

In this section, we explore if the socio-economic impact on the prevalence of diabetes runs through lifestyle factors.

[18] Women of Turkish origin have a BMI of 28.678; women of Moroccan origin of 27.468 and women of Belgian origin have a BMI of 25.130.

Men – The effect of educational level on the risk of diabetes type 2 in men becomes smaller and is no longer significant, when the variables 'body mass index' and 'lack of physical activity' are inserted in the analyses (table 2, model 2 and table 4, model 4). Therefore, we may suppose that the influence of educational attainment on diabetes prevalence is partially mediated by these lifestyle factors.

After controlling for educational attainment, the 'ethnic' differences in the prevalence of diabetes in men become even smaller. This implies that, next to lifestyle effects, there is an additional effect of educational level on the 'ethnic' differences in the prevalence of diabetes. On the other hand, accounting for educational attainment, the influences of body mass index and lack of leisure time physical activity on diabetes persist (table 4, model 3 and 4).

Table 4: Model estimates of diabetes prevalence by age, 'ethnic' origin, lifestyle factors and socio-economic determinants (men)

		Model											
		Model 1			*Model 2*			*Model 3*			*Model 4*		
Variables	Categories	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.
Intercept		0.010	0.147	***	0.010	0.156	***	0.009	0.163	***	0.010	0.212	***
Age - 35		1.071	0.005	***	1.069	0.006	***	1.070	0.006	***	1.069	0.006	***
'Ethnic' origin	Belgian (ref.)	1.000			1.000			1.000			1.000		
	Turkish	1.653	0.533	*n.s.*	1.272	0.741	*n.s.*	1.121	0.753	*n.s.*	1.061	0.756	*n.s.*
	Moroccan	2.113	0.282	**	1.756	0.341	*n.s.*	1.868	0.343	*n.s.*	1.805	0.346	*n.s.*
Lifestyle factors													
BMI - 25,77		1.097	0.011	***				1.095	0.012	***	1.094	0.012	***
Lack of physical activity	Weekly physically active (ref.)				1.000			1.000			1.000		
	Sedentary				1.538	0.119	***	1.423	0.121	**	1.395	0.122	**
Socio-economic factors													
Educational attainment	No diploma/prim. ed. (ref.)										1.000		
	Lower sec. ed.										1.020	0.162	*n.s.*
	Higher sec. ed.										0.878	0.165	*n.s.*
	Higher ed.										0.807	0.174	*n.s.*
	Deviance	2,711.047			2,420.736			2,341.165			2,338.702		
	$D\chi^2$ [a]	266.169		***	185.513		***	244.291		***	246.753		***
	Df	4			4			5			8		
	AIC	2,721.047			2,430.736			2,353.165			2,356.702		
	BIC	2,755.657			2,464.781			2,393.938			2,417.862		
	N	7,495			6,694			6,605			6,605		

[a] Deviances are always compared to the respective intercept model

Significance: *** p < 0.001; ** p < 0.01; * p < 0.05; n.s.: not significant

Women – When BMI and lack of physical activity are included in the analyses, the effect of educational level on the risk of diabetes becomes a bit smaller, but remains significant (table 3, model 2 and table 5, model 4). In women too, the influence of educational level on the risk of diabetes is likely to run partially through the lifestyle factors 'body mass index' and 'lack of (leisure time) physical activity', although other factors – not inserted in these analyses – mediate the relationship between educational level and the prevalence of diabetes. Moreover, after controlling for educational level, the 'ethnic' differences in the prevalence of diabetes become smaller, though the odds ratios for Turkish versus Belgian and for Moroccan versus Belgian women are still rather high (odds $ratio_{Turkish\text{-}Belgian}$ = 6.872 and odds $ratio_{Moroccan\text{-}Belgian}$ = 2.215). Thus, in women, other determinants play an important part in the 'ethnic' differences in diabetes prevalence (cf.

discussion). As in men, the effects of the lifestyle factors on the prevalence of diabetes remain significant (table 5, model 4).

Table 5: Model estimates of diabetes prevalence by age, 'ethnic' origin, lifestyle factors and socio-economic determinants (women)

		Model											
		Model 1			*Model 2*			*Model 3*			*Model 4*		
Variables	Categories	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.	e^b	se(b)	Sig.
Intercept		0.010	0.159	***	0.007	0.167	***	0.007	0.179	***	0.010	0.225	***
Age - 35		1.062	0.006	***	1.064	0.006	***	1.060	0.006	***	1.055	0.006	***
'Ethnic' origin	Belgian (ref.)	1.000			1.000			1.000			1.000		
	Turkish	7.084	0.334	***	9.058	0.376	***	8.243	0.388	***	6.872	0.396	***
	Moroccan	3.263	0.266	***	3.674	0.298	***	2.554	0.334	**	2.215	0.339	*
Lifestyle factors													
BMI - 25,77		1.134	0.010	***				1.128	0.010	***	1.123	0.010	***
Lack of physical activity	Weekly physically active (ref.)				1.000			1.000			1.000		
	Sedentary				2.507	0.123	***	2.019	0.130	***	1.930	0.131	***
Socio-economic factors													
Educational attainment	No diploma/prim. ed. (ref.)										1.000		
	Lower sec. ed.										0.863	0.157	*n.s.*
	Higher sec. ed.										0.828	0.174	*n.s.*
	Higher ed.										0.486	0.234	**
	Deviance	2,412.287			2,321.598			2,072.725			2,062.089		
	$D\chi^{2a}$		378.246	***		250.063	***		374.465	***		385.101	***
	Df			4			4			5			8
	AIC	2,422.287			2,331.598			2,084.725			2,080.089		
	BIC	2,457.018			2,365.932			2,125.738			2,141.609		
	N			7,678			7,093			6,874			6,874

[a] Deviances are always compared to the respective intercept model

Significance: *** p < 0.001; ** p < 0.01; * p < 0.05; n.s.: not significant

DISCUSSION

In the first subparagraph, we put the results in a broader context. Subsequently, we explore possible mechanisms contributing to the relatively high diabetes prevalence in Belgian women of Turkish and Moroccan origin. We summarize some determinants – other than body mass index, lack of leisure time physical activity, educational attainment and income – that could play an important part in this 'ethnic' health disparity. Finally, we formulate some policy recommendations and implications for further research.

THE RESULTS IN A BROADER FRAMEWORK

As in many other countries (5-13), we found 'ethnic' differences in diabetes prevalence. The prevalence of diabetes type 2 is higher in Belgians of Turkish and Moroccan origin than in native Belgians. Although figures are not entirely comparable, we may assume that the prevalence of diabetes in Belgians of Turkish and Moroccan origin is higher than in Turkey and Morocco respectively. In 2003, the prevalence of diabetes in the age group of 20- to 79-year-olds amounted to 5 to 8 % in Turkey and 2 to 5 % in Morocco, according to the International Diabetes Federation (IDF)

(3). King, Aubert and Herman (33) reported comparable prevalence rates. These figures are based on measured diabetes. Based on HIS 97-01-04, we find a prevalence of diabetes of 6.5 % in 20- to 79-year-old Belgians of Turkish origin and of 5.8 % in 20- to 79-year-old Belgians of Moroccan origin. As our findings are based on self-reported diabetes, we may assume an underestimation by at least one third. This would imply that – in the age group of 20- to 79-year-olds – approximately 8.7 % of the Belgians of Turkish and 7.7 % of the Belgians of Moroccan origin have diabetes. That is considerably higher than the estimates of both the IDF (3) and King, Aubert and Herman (33). These findings are in line with the proposition that both genetic and environmental factors could play an important part in the development of diabetes type 2.

In this study, we examined the contribution of the lifestyle factors 'body mass index' and 'lack of leisure time physical activity' as well as of the socio-economic determinants 'educational attainment' and 'income' to 'ethnic' differences in the prevalence of diabetes.

At first sight, the relative contribution of the variable 'income' to this 'ethnic' morbidity gap seemed rather minor. When one takes a closer look, the relation between income and diabetes type 2 seems more complex and differs according to 'ethnic' origin. However, due to the relative small number of Belgians of Turkish and Moroccan origin, it is very difficult to draw conclusions from the association between income and diabetes in these communities. Yet, it might be hypothesized that the association 'income – diabetes' may resemble the relation 'income – body mass index'. In indigenous Belgian men and women, a lower income is associated with a higher BMI. In Belgian men of Turkish and Moroccan origin on the other hand, a higher income is associated with a higher body mass index. This 'inverse' relation in men of Turkish and Moroccan descent might partially be explained by the fact that, in a first phase, an increase in income (often implying less physically taxing jobs) is accompanied by increased food availability and a lack of health knowledge. After a while, health knowledge may increase as well and a higher income might be associated with a lower body mass index. In Turkish women, the association between income and BMI was not statistically significant. In Belgian women of Moroccan descent, like in native Belgian women, a positive association was observed. A somewhat tentative hypothesis for not observing the 'inverse' relation between income and BMI in women of Turkish and Moroccan origin might be that western beauty ideals (from the world of advertising) pervade the life world of these women, especially in the higher income groups.

In this study, we found evidence that body mass index, lack of leisure time physical activity and educational attainment play an important part in the higher diabetes prevalence in the Turkish and Moroccan communities in Belgium. In both men and women, the inclusion of educational attainment in the analyses makes the 'ethnic' differences in diabetes prevalence become smaller. The influence of lifestyle factors on the community differences in the prevalence of diabetes is less univocal. After controlling for 'body mass index' or 'lack of (leisure time) physical activity', the 'ethnic' differences not always become smaller. Sometimes, the odds ratios for Turkish versus Belgian or for Moroccan versus Belgian men/women become even larger. In men, the lifestyle variable 'a lack of physical activity' appeared to play an important part in the higher mean diabetes probability in men of Turkish and Moroccan origin. In women, the higher risk of diabetes type 2 among women of the Turkish and Moroccan communities in Belgium is particularly associated with their higher mean body mass index. In men as well as in women, the influence of educational attainment on the risk of diabetes type 2 becomes smaller, when the lifestyle factors 'body mass index' and 'lack of (leisure time) physical activity' are included in the analyses. In both men and women, the results are thus in line with the underlying model that socio-economic differences in the prevalence of diabetes are likely to be mediated by lifestyle factors. In women however, other determinants – other than body mass index, lack of leisure time physical activity, educational attainment and income – play an

important part in the 'ethnic' differences in diabetes prevalence, as the odds ratios for Turkish versus Belgian and Moroccan versus Belgian women remain high.

POSSIBLE EXPLANATIONS FOR THE RELATIVELY HIGH DIABETES PREVALENCE IN BELGIAN WOMEN OF TURKISH AND MOROCCAN ORIGIN

Thus, possible explanations have to be sought elsewhere. The migration experience, psychosocial stress, pregnancies and gestational diabetes, differences in sensitivity to the action of insulin and a higher lead exposure are presented as possible explanations for this ethnic morbidity gap. An important remark is that these explanations are not exhaustive nor mutually exclusive.

As we may assume that the prevalence of diabetes type 2 is higher in Belgians of Turkish and Moroccan origin than in Turks and Moroccans living in Turkey and Morocco respectively, it might be hypothesized that the ***migration experience*** and the associated rapid changeover to a western lifestyle (low level of physical activity, calorie rich diet ...; often accompanied by a high rate of weight gain) contribute to the higher diabetes prevalence in Belgian women of Turkish and Moroccan origin. A high rate of weight gain is assumed to be an independent risk factor of diabetes type 2, irrespective of obesity (32, 34).

Dietary habits may play an important part in the 'ethnic' differences in diabetes prevalence. With regard to nutritional behaviour, the habits of Turkish and Moroccan migrants seem to be healthier at some points and less healthy in other aspects (35-36). In general, their diet consists of more fruit and vegetables and less saturated fat, but their eating pattern is very irregular. In Ghent, a study about dietary habits in Turkish diabetes patients was conducted. One of the findings was that Belgians of Turkish origin normally have a hot meal twice a day, often having white bread with it. That results in the consumption of a great amount of carbohydrates (16). Malki and Waterval (36) descry the same pattern in Dutch Moroccans. Moreover, they state that the irregular eating pattern – eating when hungry – makes Dutch people of Moroccan origin eat bigger helpings. Another often cited dietary explanation for the relatively high diabetes prevalence in women of Turkish and Moroccan origin is unbalanced eating habits (17).

Additionally to diet, ***psychosocial stress*** may also be an important factor in the high prevalence of diabetes in women of both Turkish and Moroccan origin. Already in the 17th century, the relationship between stress and diabetes was proposed by Thomas Willis (37-38). Today, the relationship between blood glucose level and acute stress situations is demonstrated in a number of studies (39). Less is known about the influence of chronic stress on diabetes (37). Björntorp (40) hypothesized that psychosocial stress with a defeatist or helplessness reaction leads to 'hypothalamic arousal', which is expressed as a high rate of secretion of cortisol and a low rate of secretion of sex steroids. This hormonal imbalance directs storage fat to visceral adipose tissue (40-41). Furthermore, an increase in serum cortisol and a decrease in sex steroids affect the insulin activity and may cause hyperglycaemia (40). This theory of Björntorp was investigated in the Hoorn study (42). In this study, carried out in the Dutch city of Hoorn, a high number of major stressful life events during the past five years was associated with a higher prevalence of previously unknown diabetes. This association persisted after adjustment for age, sex, lifestyle variables and socio-economic indicators. Moreover, stressful life events were positively related to visceral adiposity. However, in contrast with Björntorp's theory, waist-to-hip ratio did not mediate the association between psychological stress and type 2 diabetes. As stated above, another important element in the theory of Björntorp (40) is the 'defeatist' or 'helplessness' reaction. In individuals, who are biologically or otherwise at risk to develop diabetes, stress is not sufficient to 'cause' diabetes, but stress coupled with a feeling of 'loss of control' may lead to diabetes. This is in line with more recent research, where Swedish women

experienced a higher diabetes risk only if they were exposed to both low decision latitude and low sense of coherence (43). To conclude, psychosocial stress is repeatedly cited as an important risk factor in the higher diabetes prevalence among recently westernized populations (5-6, 11-13). Recently westernized populations, like Belgians of Turkish and Moroccan origin, often live in a country that still is foreign to them. That may bring along psychosocial stress. Moreover, their generally lower socio-economic status, discrimination experiences, and perceived lack of social support may also cause stress. Finally, migration and the consequences of migration are often very stressing (6, 44). Based on qualitative interviews with a group of immigrant women, Mirdal (44) concludes that Turkish women living in Denmark are suffering from *passive stress*, which occurs under chronic conditions of helplessness. It might thus be hypothesized that the combination of stress and feelings of helplessness may play a part in the relatively high diabetes prevalence in Belgian women of Turkish and Moroccan origin.

Next to dietary habits and psychosocial stress, ***pregnancy*** – and in particular ***gestational diabetes*** – may also offer an explanation for this 'ethnic' disparity in diabetes prevalence (45). According to Satman et al. (29), obesity and glucose intolerance become common in women beyond childbearing age in Turkey. It might be hypothesized that Turkish and Moroccan women are already overweighed/obese before they get pregnant. Consequently, during the pregnancy period, they are at a higher risk of gestational diabetes (46). Moreover, after having a baby, they never lose their excess weight. Both excess weight and gestational diabetes are independent risk factors of diabetes type 2 (1, 3-4). Additionally, parity is higher in the Turkish and Moroccan communities than in the Belgian community (47). A cycle, in which excess weight/obesity, pregnancy and gestational diabetes reinforce one another and cause diabetes mellitus type 2, could appear. Nevertheless, we were not able to test this hypothesis as 'parity' was not questioned in HIS 97-01-04. Therefore, we suggest the inclusion of this variable in future health surveys.

Another possible explanation for the relatively high diabetes prevalence in Belgian women of Turkish and Moroccan origin might be that there are ***differences in sensitivity to insulin's antilipolytic[19] and glucoregulatory[20] action*** between Belgian women of Turkish and Moroccan origin and native Belgian women. For example, Sumner et al. (48) report a much higher prevalence of obesity and diabetes in African-American women than in Caucasian women. They argue that the higher prevalence of diabetes in obese African-American women may be due to a combined presence of sensitivity to insulin's antilipolytic action with resistance to its glucoregulatory action. Obese Caucasian women on the other hand, are resistant to both insulin as an antilipolytic and glucoregulatory hormone.

Next to the above explanations, it might be hypothesized that a ***higher lead exposure*** could be (partially) responsible for the relatively high diabetes prevalence in Belgian women of Turkish and Moroccan origin. Standard lead sources are tap water, paint chips and dust; sources of lead, which are mostly found in old, ramshackle houses (49). Due to their generally lower socio-economic status, Belgians of Turkish and Moroccan origin are more likely to live in such dwellings. Other – less standard – sources of lead intoxication are traditional medicines (especially some herbs) (50) and metallic teapots, traditionally used by North African populations (51). In the Turkish and Moroccan communities, traditional healers are more often consulted than among the native Belgian population. Moreover, they have a 'culture' of tea sipping (51-52). Many negative health consequences ensue from (high) lead exposure. In adults, a positive association of lead exposure with blood pressure – an independent risk factor of diabetes type 2 – has been identified in a number

[19] Antilipolytic means inhibiting the breakdown of the body's fat stores.

[20] Glucoregulatory means promoting the tissue uptake of plasma glucose.

of studies in different settings. Schwartz (53) and Navas-Acien et al. (54) conclude that the evidence is sufficient to infer a causal relationship of lead exposure with hypertension. Moreover, exposure to lead is also positively associated with coronary heart disease and stroke (54). Bener et al. (55) found a positive correlation between blood lead levels and fasting serum glucose, indicating that lead exposure may be associated with diabetes. Afridi et al. (56) recently demonstrated that the concentration of the toxic metals arsenic, cadmium and lead is higher in samples of smoker and non-smoker diabetic patients as compared to their smoker and non-smoker controls. Other studies (57-58) showed that diabetics are more vulnerable to the damaging effects of long-term exposure to lead, such as renal dysfunction and inflammation.

POLICY RECOMMENDATIONS

In this case study, we found an excess diabetes rate in the Turkish and Moroccan communities in Belgium. As diabetes type 2 occurs predominantly at an advanced age, due to worldwide ageing – among indigenous as well as migrant populations – the prevalence is expected to rise in the near future. The costs for the individual and the society will be tremendous. Consequently, prevention of diabetes type 2 is extremely important. Moreover, prevention of type 2 diabetes mellitus also gains importance as the same risk factors underlie other disorders, such as cardiovascular and cerebrovascular diseases, and as diabetes is accompanied by an increased death probability, especially due to an increased cardiovascular-related mortality (1-2).

Identification of risk factors and risk groups of diabetes is a conditio sine qua non for an efficient preventive policy. In this study, we already identified some risk factors – a lack of leisure time physical activity, body mass index and educational attainment – and one high risk group – adults of Turkish and Moroccan origin and in particular women of Turkish and Moroccan origin. The body of literature on diabetes and on 'ethnic' differences in diabetes prevalence shows that other risk factors, such as diet, lead exposure and gestational diabetes, could also play an important part.

Policy makers could take action on different tracks. As the diabetes prevalence in the Turkish and Moroccan communities in Belgium is high, diabetes prevention and care, specifically aimed at these communities, are necessary.

The results of this study indicate that a wide range of interventions is possible. ***Primary prevention*** campaigns could be set up (59), addressing a number of risk factors of type 2 diabetes mellitus: pointing at the risks of being overweighed/obese, promoting knowledge and skills in the field of healthy eating, encouraging adults of Turkish and Moroccan origin to participate in sports and other types of physical activity ... Such actions could be implemented in existing initiatives, but should minimally be developed in dialogue with these communities. In this way, the authorities can gain insight into specific 'thresholds' that could impede the implementation of certain measures. For example, it could be important that sports activities are provided for men and women separately. Since the diabetes prevalence rates of Turkish and Moroccan women in Belgium are alarmingly high, ***secondary prevention*** should in the first place be aimed at this particularly high risk group (59). An active screening of these women should be considered as one of the most important tracks for preventive policy. Nevertheless, costs and benefits should be weighed up against each other. Furthermore, as part of ***secondary and tertiary prevention***, persistent attention should be paid to campaigns addressing the benefits of healthy eating and sports and the risks associated with being overweighed/obese … Finally, the results of this study are indicative for a protective effect of educational attainment. A higher educational level is associated with a lower risk of diabetes type 2. Therefore, enduring efforts should be made to improve the ***educational level*** of persons from the Turkish and Moroccan communities in Belgium.

Although further research is necessary, a number of prevention and care initiatives are already conceivable. ***Primary prevention*** campaigns could for example address the possible sources of lead (such as metallic teapots) and the damaging effects of lead exposure or pay extra attention to a very high risk group for developing diabetes type 2, namely women of Turkish and Moroccan origin with gestational diabetes. In collaboration with Child and Family (*Kind en Gezin*) and diabetes clinics, it might be possible to approach these women and present them a sort of information and education package on diabetes. In the framework of ***tertiary prevention***, a clear communication between patient and physician, self monitoring, and culture-specific care and education could be important (13, 16, 59).

To conclude, the authorities should keep supporting existing initiatives, like Réseau Santé diabète-Marolles, and should invest in research in order to unravel the mechanisms responsible for the high prevalence of type 2 diabetes mellitus in Belgians of Turkish and Moroccan origin.

IMPLICATIONS FOR FURTHER RESEARCH

Large-scale surveys are not always the most appropriate research instruments to gather information with regard to 'ethnic-cultural' minorities. Further – mainly qualitative – research into the relatively high diabetes prevalence of women in the Turkish and Moroccan communities is thus necessary in order to unravel the specific – cultural and environmental – mechanisms at stake and to fine-tune preventive policy on this target group. Moreover, to our knowledge, there are no data on the prevalence of gestational diabetes in the Turkish and Moroccan communities in Belgium. Research, which addresses this type of diabetes, should also be carried out in the future. Other diabetes-related research could be aimed at establishing the association between gestational diabetes and diabetes type 2 both in the mother and in her offspring (7, 9, 45). To conclude, a recent study from the Netherlands showed that Moroccan children have a higher incidence of diabetes type 1 compared to other children, with serious impact on their health perspective. Turkish children on the other hand, showed a lower risk for diabetes type 1 (60). As far as we know, no research in Belgium exists into the 'ethnic' differences in incidence of type 1 diabetes mellitus. Such investigations should be carried out in order to determine whether such 'ethnic' differences also exist in Belgium and if they do, which factors are responsible for this morbidity gap.

CONCLUSION

In this article, we presented an illustration of migrant health research, namely an inquiry into diabetes type 2 in Belgian women of Turkish and Moroccan origin. This study provides evidence for a high prevalence and early onset of diabetes type 2 in Belgians of Turkish and Moroccan origin. We identified some risk factors of this 'ethnic' health disparity. The most important socio-economic determinant for the relatively high diabetes prevalence in both men and women of Turkish and Moroccan origin is educational attainment. The influence of lifestyle factors on community differences in diabetes is more complex. In men, a lack of physical activity plays an important part. In women, the higher mean diabetes probability in the Turkish and Moroccan communities is particularly associated with their higher mean body mass index. However, some of the 'ethnic' differences in diabetes prevalence in women could not be explained; the odds ratios for Turkish versus Belgian and Moroccan versus Belgian women remain high. In the discussion, we hypothesized that cultural and environmental factors in particular, such as dietary habits, history of gestational diabetes and lead exposure, may play an important part. We closed the discussion with a plea to put diabetes (type 2) high on both political and research agendas.

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