

Diabetes and related psychological distress

Karin Elisabeth Gulbrandsen

NORWEGIAN UNIVERSITY OF LIFE SCIENCES
Department of Plant and Environmental Sciences
Master Thesis in Public health Science, 30 credits 2012



Diabetes and related psychological distress

Karin Elisabeth Gulbrandsen

Master of Public Health Science 2012

30 credits

Norwegian University of Life Science (UMB)
Department of Plant and Environmental Sciences



The National Institute of Public Health
Division of Mental Health



ACKNOWLEDGEMENT

The work presented in this study was performed at the National Institute of Public Health, Division of Mental Health, between August 2011 and May 2012. It has been exciting and very educational throughout the process.

First and foremost I offer my sincerest gratitude to my supervisors; Ruth Kjærsti Raanaas at the Norwegian University of Life Science (UMB), and Jocelyne Clench-Aas at The Norwegian Institute of Public Health Division of Mental Health, who have supported me throughout my thesis with their patience and knowledge whilst allowing me the room to work in my own way.

Next, I would like to thank my fiancé, who has put up with a fumbled house, late night dinners, and perhaps not a particular “miss sunshine” housemate. Thank you.

I want to thank my mum for taking the time to give me feedback on my thesis, and my sisters for support and always believing in me throughout my studies at the University of Life Science (UMB).

Finally, the memory of my father and his life with diabetes has been a great inspiration to my work.

Oslo, May 2012

Karin Elisabeth Gulbrandsen

CONTENTS

ACKNOWLEDGEMENT	3
SUMMARY	6
SAMMENDRAG	7
1.0 INTRODUCTION	8
1.1 AIMS AND RESEARCH QUESTIONS.	8
1.2 DIABETES MELLITUS.	9
1.2.2 Risk factors.	9
1.2.3 Prevention.	10
1.3 CO-MORBIDITY.	10
1.4 COPING RESOURCES.	11
1.5 DIABETES IN A PUBLIC HEALTH PERSPECTIVE.	12
2.0 METHODS.....	13
2.1 HEALTH SURVEY OF LEVEL OF LIVING, 2002.	13
2.2 PROCEDURES.	14
2.3 MEASURING INSTRUMENTS.	16
2.4 STATISTICAL ANALYSIS.	18
2.5 ETHICS.	19
3.0 RESULTS.....	19
3.1 RESULTS SUMMARY.	19
4.0 DISCUSSION.....	20
4.1 RELIABILITY.	20
4.2 VALIDITY.	21
4.2.1 Statistical conclusion validity.	21
4.2.2 Construct validity.	24
4.2.3 Internal validity.	26
4.2.4 External validity.	26
4.3 DIABETES AND RELATED PSYCHOLOGICAL DISTRESS.	27
4.4 THE MODIFYING ROLE OF SENSE OF MASTERY AND SOCIAL SUPPORT.	27
4.5 SEVERITY AND DURATION, DIABETES AND CO-MORBIDITY.	28
4.6 PUBLIC HEALTH PERSPECTIVES.	29
4.7 PERSPECTIVES FOR THE FUTURE.	30
5.0 CONCLUSION	31
REFERENCES.....	32
ARTICLE: <i>Diabetes and related psychological distress. The modifying role of sense of mastery and social support</i>.....	36
APPENDIX 1: Key numbers from the Health Survey	58
APPENDIX 2: Helping Card.....	59
APPENDIX 3: HSCL-25.....	60
APPENDIX 4: Sense of mastery (5-items).....	61
APPENDIX 5: Informal letter.....	62

LIST OF FIGURES AND TABLES

List of figures and tables in the thesis

Figure 1:	Percentage of total NCD deaths in 2008 (WHO, 2010)	12
Table 1:	Response rate to postal questionnaire and interview	15
Table 2:	Prevalence rate of the segregated sample	17
Table 3:	Prevalence of the response to postal questionnaire	18

List of figures and tables in the article

Figure 1	Percentage of symptoms of depression	53
Figure 2	Percentage of symptoms of anxiety	54
Table 1:	Response prevalence	50
Table 2:	Stepwise logistic regression and depression (OR)	52
Table 3:	Stepwise logistic regression and anxiety (OR)	52

SUMMARY

The purpose of this study is to examine the association between people with diabetes, either alone or with co-occurring somatic diseases and psychological distress among adults in Norwegian, and to explore to what extent the association is modified by sense of mastery and social support. The study is presented in an article (Gulbrandsen et al. in prep.) with an additional thesis. Data were obtained from a cross-sectional health survey conducted in Norway in 2002, where 6 827 people above the age of 15 years participated. Totally, 16.3 percent of persons with diabetes alone reported having symptoms of depression and anxiety. This group was associated with 3 times greater odds for anxiety compared to a control group with no known somatic diseases, and 2 times greater odds for depression. Sense of mastery, but not social support protected against depression for this group. Totally, 17.4 percent of persons with diabetes and somatic co-morbidity reported symptoms of depression, and 11.6 percent reported symptoms of anxiety. The odds for both were approximately 2 times greater than control group with no known somatic diseases. Sense of mastery, but not social support protected in both conditions.

This study suggests that persons with diabetes alone report symptoms of anxiety, while those with diabetes and simultaneous somatic co-morbidities indicate depression and anxiety. Individual disease characteristics, such as duration, severity, and the presence or absence of somatic co-morbidities emerge as factors that can influence the protective effect of sense of mastery and social support on psychological distress.

Diabetes and psychological distress are public health challenges that need attention. The study suggests that health providers emphasize a life-centred, individual-focused approach to promote diabetes management, and prevent related psychological distress

SAMMENDRAG

Formålet med denne studien er å undersøke sammenhengen mellom personer med diabetes, enten uten eller med tilleggssykdommer, og psykiske plager i den voksne befolkningen i Norge, samt undersøke i hvilken grad denne sammenhengen modifieres av mestring og sosial støtte. Studien er presentert i en artikkel (Gulbrandsen et al. in prep.) med en kappe. Data er hentet fra en tverrsnittsundersøkelse om levekår og helse, som ble utført i Norge i 2002. 6 827 personer over 15 år deltok i undersøkelsen. I gruppen med personer som kun har diabetes, rapporterte 16.3 prosent symptomer på depresjon og angst. Denne gruppen er assosiert med dobbelt så stor sannsynlighet for depresjon, og tre ganger så stor sannsynlighet for angst, sammenliknet med kontroll gruppen. Kontrollgruppen består av personer uten kjente somatiske sykdommer. Videre viser analysen at mestring er en beskyttende faktor mot depresjon, mens sosial støtte ikke har noen innvirkning på depresjon. 17.4 prosent av personer med diabetes og somatisk komorbiditet rapporterte symptomer på depresjon, og 11.6 prosent rapporterte symptomer på angst. Sammenliknet med kontrollgruppen, er det for denne gruppen assosiert en dobbelt så stor sannsynlighet for både angst og depresjon. Mestring er en beskyttende faktor mot både depresjon og angst, mens sosial støtte er en beskyttende faktor mot angst.

Studien antyder at personer som kun har diabetes rapporterer symptomer på angst, mens personer som har diabetes og samtidig somatiske tilleggssykdommer indikerer depresjon og angst. Individuell sykdoms karakteristikk, som for eksempel varighet, alvorlighetsgrad og tilstedeværelse eller fravær av somatiske tilleggssykdommer, fremstår som faktorer som kan påvirke den beskyttende effekten mestring og sosial støtte har på psykiske plager.

Diabetes og psykiske plager er folehelseutfordringer som trenger økt oppmerksomhet. Studien foreslår at folkehelsearbeidere bør vektlegge en livssentrert og individfokusert tilnærming for å fremme opplevelsen av mestring og forebygge relaterte psykiske plager blant personer med diabetes.

1.0 INTRODUCTION

Diabetes is a chronic disease, with rates exploding worldwide (World Health Organization 2010a). Today, diabetes constitutes a public health challenge and an economic burden in Norway (Mykletun et al. 2006; World Health Organization 2010a). Living with diabetes has been described as a difficult process. It requires long-term adherence to a complex diet, physical activity, medication and blood glucose monitoring (American Diabetes Association 2012). To live with the disease, people need to integrate demanding self-care activities into their daily lifestyle, and learn to cope with the potential of developing long-term complications that increases the risk of co-occurring somatic diseases, causing individual morbidity and mortality (American Diabetes Association 2012). In addition, diabetes is strongly associated with related psychological distress, mainly depression and anxiety (Clarke & Currie 2009).

Coping resources can benefit adult's ability to cope and sustain normal circumstances in life when facing adversities, such as the life threatening disease diabetes (Taylor & Stanton 2006). Sense of mastery and social support are factors that may contribute as coping resources (Taylor & Stanton 2006). It is therefore of interest to understand to what extent individuals' sense of mastery and social support (from family, friends and neighbors) can contribute positively as potential coping resources in the association between diabetes and related psychological distress.

1.1 Aims and research questions.

In the present study the aim was to examine the association between the chronic disease diabetes and psychological distress in a large Norwegian representative sample, and to explore to what extent the association is mediated by sense of mastery and social support. The research questions are: Do relatively more people with diabetes, either alone or with somatic co-morbidity suffer from anxiety and depression compared to people with no known somatic disease? Can sense of mastery serve as a coping resource that can reduce anxiety and/ or depression among people with diabetes, either alone or with somatic co-morbidity? Can social support serve as a coping resource that can reduce anxiety and/ or depression among people with diabetes, either alone or with somatic co-morbidity? The study is presented in an article (Gulbrandsen, in prep.) with additional thesis.

1.2 Diabetes mellitus.

The term diabetes mellitus describes a metabolic disorder of multiple etiologies, characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (Bahr 2009). The classification of diabetes includes four clinical classes (American Diabetes Association 2012), though the two most common classes will be addressed in this thesis. Type 1-diabetes (T1D) is characterized by deficient insulin production due to an autoimmune reaction that leads to destruction of beta cells in the pancreas (Bahr 2009). The situation requires daily administration of insulin to prevent the development of ketoacidosis, coma and death. In recent years, the number of children and adolescents (0-18 years) with recently detected T1D has increased (The Norwegian Institute of Public Health 2011). A total of 269 cases were detected in 2000 and 354 cases in 2009. This trend is also reported internationally and among adults, however the exact numbers are unclear. Type 2- diabetes (T2D) is characterized by both the body's ineffective use of insulin (due to insulin resisting cells) and ineffective insulin secretion. Medical treatments are blood glucose lowering tablets or injected insulin (Bahr 2009).

In previous studies, T1D is classified as child-onset, and T2D as adult-onset, but this is no longer the case. In the present years such classification has been slowly wiped out, due to occasionally similar clinical presentation and disease progression at an early stage (American Diabetes Association 2012). For instant, people with T1D may have late onset and slow progression, whereas people with T2D may present ketoacidosis, which is most common for T1D. The cause of diabetes onset is a combination of genetic predisposition and environmental factors, but what is behind the disease process is still unclear (Diabetesforbundet 2011b).

1.2.2 Risk factors.

Diabetes incidences are strongly associated with the “Westernised lifestyle”, mainly in terms of dietary habits and physical activity (van Dam et al. 2002). These habits are characterized by high intake of processed meat, red meat, butter, high-fat dairy products, eggs, refined grains, and sedentary lifestyle. A synergistically interaction of genetic predisposition on the association between western lifestyle and incidences of diabetes is reported (Qi et al. 2009). Other lifestyle factors that are associated with increased risk for diabetes is smoke and high BMI (American Diabetes Association 2012; Orozco et al. 2008). Hypertension, previous

gestational diabetes, family history and some ethnical groups are also reported to be associated with increased risk for diabetes.

1.2.3 Prevention.

Exercise and diet are protective factors against diabetes (Orozco et al. 2008). Together, they reduce the relative risk of diabetes incidences by 37%. This great result was reported due to the favourable effects these factors have on body weight, waist circumference and blood pressure. The typical preventative diet is characterized by caloric restriction, low content of fat (especially saturated fat) and carbohydrates, and increased fibre intake. Favourable effects of physical activity are seen when an average of at least 150 minutes each week of brisk walking, or other activities such as cycling or jogging are accomplished. Evidence on effects of diet alone is poor (Nield et al. 2009).

Diabetes treatment regimes require encompassing lifestyle adaptations and medication intake (as mentioned earlier). Diet and physical activity are though primary treatment regimes recommended for people with T2D. Several treatment recommendations have failed to improve or facilitate adherence to diet or physical activity among people with diabetes (Vermeire et al. 2009). These treatment recommendations included education (information, feedback), incentives, electronic devices, decision support systems, use of facilitators, facilitating of self-recording or self-management, scheduling appointments, health-care organisation, specific diabetes services and health-care provider-patient relationship. Luckily, some did. Social support from family and friends are reported to be a key element (Gallant 2003; Qiu et al. 2012).

Prevention of T1D is difficult since the onset is caused by an autoimmune reaction in genetically predisposed people triggered by environment and virus (Achenbach et al. 2004; American Diabetes Association 2012; Honeyman et al. 2000). However, measurement of islet autoantibodies is suggested to identify individuals at risk for developing T1D (American Diabetes Association 2012).

1.3 Co-morbidity.

Over time, people with diabetes have increased risk for developing long-term complications in the cardiovascular system, blood vessels, eyes, kidneys, and nerves (Bahr 2009). Due to such complications many people with diabetes suffer simultaneously from other diseases such

as cardiovascular diseases, foot ulcers, blindness, kidney failure, damaged neuropathy, stroke and heart disease (myocardial infarction) (American Diabetes Association 2012). Cardiovascular diseases are the most common co-morbid disease among people with diabetes. Co-occurring somatic disease among people with diabetes is reported to be the main explanation for an overall risk of premature death and functional disability (Nolan et al. 2011).

1.4 Coping resources.

Over the years coping has acquired a variety of conceptual meanings, being commonly used interchangeable with concepts as mastery, defense and adaptation (Pearlin & Schooler 1978). In the context of the present study coping refers to the process of attempting to manage the demands or stressful events created by the chronic disease diabetes, that may be appraised as taxing or exceeding individual's resources (Lazarus & Folkman 1984).

Exceeding demands or stressful events have been tied to activation of the sympathetic nervous system and changes in proinflammatory cytokine, where outcome can be psychological distress like anxiety and depression (Taylor & Stanton 2006). However, different coping resources may affect the association between stressful events and psychological distress. A successful resolution depends however on individuals' adaptive or maladaptive coping efforts and the form that the resources assume affect.

Mastery and social support are two of four coping resources identified to improve the ability to cope (Taylor & Stanton 2006). The two others are optimism and self-esteem that are not in the loop for this thesis. Mastery refers to whether a person feels able to control or influence outcome (Taylor & Stanton 2006), that can be linked to how the term sense of mastery is applied in the present thesis and in the article (Gulbrandsen et al. in prep.). Sense of mastery is associated with better psychological and physical health, and decreased mortality (Taylor & Stanton 2006). Though, also seen regarding social support. Social support has been tied to people's perception of being cared for and valued by others, which is seen to reduce psychological distress, and promote psychological adjustment to challenging conditions.

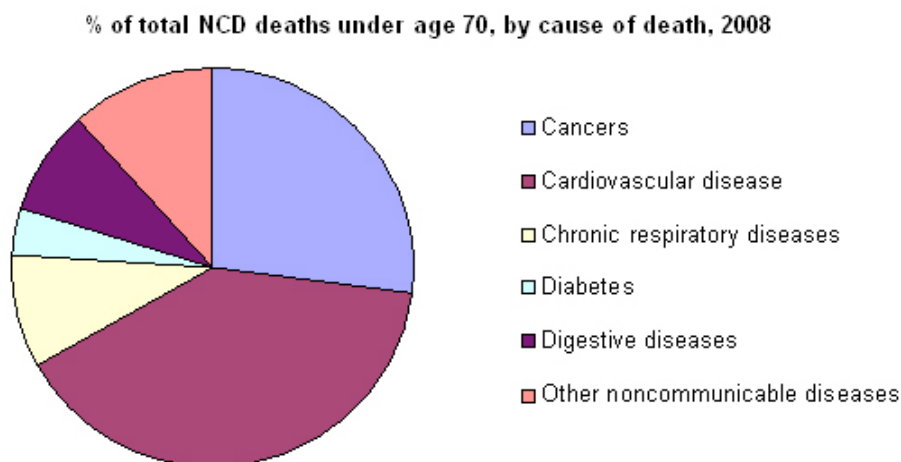
An important note is that no single coping mechanism is reported to be so outstandingly effective that its possession alone would insure out ability to fend off the challenging conditions (Pearlin & Schooler 1978).

1.5 Diabetes in a public health perspective.

Diabetes is a major public health challenge in Norway (Diabetesforbundet 2011a; Diabetesforbundet 2011b). The global burden of diabetes (GBD) is measured by The World Health Organization (WHO) using the disability-adjusted life year (DALY)(World Health Organization 2012). A total of 57 million deaths occurred globally in 2008. Of these, 36 million – almost two thirds – were due to noncommunicable diseases (NCD) (World Health Organization 2010a), whereas diabetes caused 1.3 million deaths. The disease imposes large, avoidable costs in human, social and economic terms.

Figure 1 shows the proportion of NCD deaths (in 2008) among people under the age of 70 years in 2008, reported by WHO 2010. Diabetes was responsible for 4% of deaths. Cardiovascular diseases were the largest proportion of NCD deaths (39%), followed by cancers (27%). Chronic respiratory diseases, digestive diseases and other NCDs were together responsible for approximately 30% of deaths.

Figure 1. Percentage of total NCD deaths under age 70, by cause of death, 2008 (World Health Organization 2010a).



As the impact of NCDs increases, and as populations' age increases, annual diabetes deaths are projected to continue to rise worldwide (World Health Organization 2010a).

Among the ageing population, anxiety and depression are currently the most prevalent mental health problems (de Beurs et al. 2005; Luijendijk et al. 2008). In the second quarter of 2011 an average of 6.5% of all Norwegians workers were on sick leave (The Norwegian Institute of Public Health 2011). Mental disorders (manly anxiety and depression) accounted for 15.3 %

of these medical reports, and the proportion is predicted as growing. The proportion of new disability pensions due to mental disorders increased from 18.2% in 1992 to 24.4% in 2003 (Mykletun & Knudsen 2009). It is also noted that disability pension is average granted nine years earlier due to mental disorders compared to physical disorders, whereas anxiety and depression is registered as major cause of about one-third of all disability pensions in both Norway (Mykletun et al. 2006). People with mental disorders constitute a large proportion of those who are outside the labor market, and a large proportion lost resources for the community.

This enlightenment has contributed to a national public strategy plan to deal with this problem by the Norwegian Government (Arbeids- og inkluderingsdepartementet & Helse- og omsorgsdepartementet 2007-2012). The new WHO's report on; *Mental Health and Development* (2010) has also called upon the attention to focus on mental health (World Health Organization 2010b).

2.0 METHODS

The present study is based on data from a cross-sectional health survey (Hougen & Gløbøden 2002), and methods are described in the article by Gulbrandsen and colleagues (in prep.). In this chapter will therefore a more detailed description of the material obtained from the cross sectional Health Survey of Level of Living 2002, be presented.

2.1 Health Survey of Level of Living, 2002.

The cross sectional Health survey of Level of Living (2002) is part of a regularly repeated survey (3/year) in Norway, and is conducted by Statistic Norway (SN) (Hougen & Gløbøden 2002). The Section of Social Welfare Statistics is responsible for the formulation of the questions, which enter into the internally founded portion of the cross-sectional survey (interview section). The survey is organized so that external clients can pay for additional questions. These clients can subsequently access SN's questions later on after making an application. This makes it possible for the clients to study in more detail additional areas than originally included in the SN study. In 2002 the sample consisted of two subsamples due to this arrangement. The primary sample on behalf of SN, and a supplementary sample on commission from the National Institute of Public Health. Health, care and social relations

were main topics (in addition to the year of 2002) in 1998, 2005 and 2008. The survey is nationally representative.

The aim of the survey is first of all to throw light on health aspects in general and for various groups of people. Secondly it is to monitor the changes in health, both in level and in distribution in the Norwegian population. The survey represents a national representative sample of 10 000 subjects above the age of 15 years and not living in an institution (Hougen & Gløbøden 2002). The main sample and the supplementary sample contains 5 000 subjects each. See Appendix 1 for a detailed overview of key numbers.

The sample arises from SN's two step plan. In the two step plan the Norwegian country is first of all divided into a number of primary sampling areas, which in turn are divided into 109 subpopulations, called strata (Hougen & Gløbøden 2002). The criteria for stratification of primary sampling areas are industrial structure, population density and centrality, commuting- and trade patterns, media coverage and communication structure. The aim is to create strata, which are as homogenous as possible, but still geographically covered. The primary sampling units are municipalities or groups of municipalities. Municipalities with few inhabitants are grouped together with other municipalities to ensure that each sampling area consists of at least 7 per cent of the total number of inhabitants in the stratum the municipality belongs to. All municipalities with more than 30 000 inhabitants and some with 25 000 to 30 000 inhabitants constitute separate strata. In the first stage, one primary sampling area from each stratum is selected. Sampling areas which constitute separate strata are drawn with a 100 percent probability, while the remaining areas are drawn with a probability proportional to the size of the area's population. In the second stage, the sample is drawn randomly from the 109 primary samples. Respondents are drawn with a probability designed to make the sample self-weighting, i.e. all persons in the sampling frame have the same probability of selection. SN's two steps plan was only used when drawing the main sample. The supplementary sample was drawn for telephone interviews which do not require utilization of SN's two step plan (Hougen & Gløbøden 2002). It was instead systematically randomly drawn from all of the Norwegians municipalities.

2.2 Procedures.

A combination of computer-assisted personal interview (CAPI) and telephone interviews (CATI) and postal questionnaire were used to collect data (see Appendix 2 for detailed key

numbers) (Hougen & Gløbøden 2002). The postal questionnaire was used in order to obtain sensitive information on health conditions (mental health and psychosocial variables). This questionnaire included the Hopkins Symptoms Check List instrument, which measures symptoms of depression and anxiety. Subjects from the main sample were mostly interviewed by home visit (depending on participant's acceptance and distance) and the supplementary sample by telephone. Both samples were sent postal questionnaires. Main sample received all of SN's questions, whereas the supplementary sample received a shorter version. The response rate to interview and postal questionnaire are presented in Table 1. The table shows that a great share of the participants' responded to both interview and the postal questionnaire, and a small share responded only to the postal questionnaire. In the current thesis and in the article (Gulbrandsen et al., in prep.), estimates (OR) are based on the population that responded to both interview and postal questionnaire with a response rate of 70.8% (5396/7624). In proportion to the original drawn sample (n=10 000), the response rate to both interview and postal questionnaire was 54%.

Table 1

Response rate to postal questionnaire and interview.

		Interview		
		No interview	Interview	Total
Postal questionnaire	No response	0 (0%)	1431 (21%)	1431 (18.8%)
	Response	797 (12.9%)	5396 (87.1%)	6193 (81.2%)
Total	Response	797 (10.5)	6827 (89.5%)	7624 (100%)

In order to avoid erroneous responses and incorrect data registration, control subroutines was employed (Hougen & Gløbøden 2002). The interviewer was notified when data entries were doubtful, which occurred if values had exceeded the limited range. There were also built-in control subroutines for valid outcomes for the response options. The interview was performed by the interviewer, which read the question from the screen, and registered the answers directly into the data programme. Subjects in the supplementary sample that were interviewed by telephone were also sent additional material in form of a "helping card" to choose among answers to the question concerning diseases. The card provides a list of 59 diseases (See Appendix 2). Subjects interviewed by home visit were orally presented with this list. The purpose was to increase the probability of equal answers in both samples, as well as to simplify a sensitive question.

Responses from the postal questionnaire were registered manually by the Section for Interview surveys. This method was chosen because of technical problems arising from two versions of questionnaires. One postal questionnaire (as mentioned earlier) was sent to the main sample and a shorter version to the supplementary sample. Furthermore, information was also linked from the Survey of Income and Property for Households, including education and financial aid. A total of 70.4% responded to the survey and 43% of the interviews were accomplished by home visit.

2.3 Measuring instruments.

Measuring instruments are described in the article (Gulbrandsen et al. in prep.), and will therefore only be briefly presented.

Diabetes was measured with the following question: “Do you have, or have you had diabetes mellitus?” Responses were given in one of three categories (1= have, 2= have had, 3= have never had). In order to provide valid estimates and comparable groups, the sample was divided into four groups depending on disease and co-morbidity. This resulted in small proportions of people reporting to have diabetes, especially people with only diabetes and no other somatic disease (see Table 2). The control group with no known somatic diseases will be referred to as *healthy adults* further on in this thesis, though only implied as somatic healthy adults. The groups were segregated in order to distinguish between people with diabetes alone, and people with diabetes and somatic co-morbidity, and in order to separately examine their association with psychological distress. Other somatic diseases than diabetes were measured with the same type of question as for diabetes, but with a formulation referring to the disease of interest. Somatic diseases included in the article (Gulbrandsen et al., in prep.) were; epilepsy, osteoporosis, angina pectoris, coronary heart disease, stroke, cancer, allergy, high blood pressure, metabolism disease, ankylosing spondylitis (previously known as Bekhterev's disease), arthritis, chronic bronchitis/emphysema/COPD, psoriasis, atopic eczema, urinary incontinence, fractures, removed organ, and ulcers. Distinguishing between T1D and T2D was not possible, due to lack of information. Diabetes is therefore used as a general term with no reference to T1D or T2D in the article and in this thesis.

Sense of mastery was measured by five items (Appendix 4), concerning experience of control and coping with life. Chronbach's alpha was 0.86. Social support was measured by Oslo 3

Support Scale (OSS-3 scale). Demographic data that were controlled for were age, gender, education, income and lifestyle (BMI and exercise). One note of importance is that the variable “income” represents household income which takes into account that people often are part of a household where incomes and expenses are shared.

Table 2

Prevalence rate of the three segregated groups of somatic diseases and the control group.

Population	Frequency	Percent (%)
Only diabetes	54	0.7
Diabetes and other somatic diseases	181	2.4
No diabetes, but at least one other somatic disease	3666	48.1
No known somatic disease (control)	2858	37.5
Total	6759	88.7
Missing	865	11.3
Total	7624	100

The Hopkins Symptom Check List (HSCL-25) instrument was used to assess symptoms of psychological distress (Strand et al., 2003), which contains 25-items (see Appendix 3). The postal questionnaire included the HSCL-battery. Items 1-10 concerns symptoms of anxiety and items 11-25 concerns those of depression. Responses are given on a four-point scale (1= not at all to 4= extremely). The subscales of depression and anxiety are dichotomized into “low” and “high scores” with a cut off point at 1.75. Average scores >1.75 is valid predictor qualifying for psychological distress (Nettelbladt et al. 1993; Strand et al. 2003). An overview of response rate from the postal questionnaire within the segregated sample is presented in Table 3, which shows almost equal response or no response to the postal questionnaire across all of the four groups.

Table 3

The number of response to postal questionnaire for the three different groups of somatic diseases and the control group.

			Response to postal questionnaire		
			No response	Response	Total
Sample	No known somatic disease (control)		622 (21.8%)	2236 (78.2%)	2858 (100%)
	Other somatic diseases		741 (20.2%)	2925 (79.8%)	3666 (100%)
	Only diabetes		11 (20.4%)	43 (79.6%)	54 (100%)
	Diabetes and other somatic diseases		43 (23.8%)	138 (76.2%)	181 (100%)
Total		1417 (21%)	5342 (79%)	6759 (100%)	

2.4 Statistical analysis.

Direct logistic regression and stepwise logistic regression have been used in the present study, due to outcome variables being dichotomous. Direct logistic regression was performed to assess the impact of a number of factors on the likelihood that respondents would report that they had high symptoms of depression or anxiety. To assess if sense of mastery and social support could serve as a coping resource in the association between diabetes and psychological distress, stepwise logistic regression is used. Odds ratio (OR) is the effect measure when using logistic regression. OR represents the change in odds for having high symptoms of depression/ anxiety for individuals with diabetes, either alone or with somatic co-morbidity compared to healthy individuals, when all other factors are held equal (gender, age, education, income etc). OR is given with a 95% confidence interval ($p < 0.05$). In the statistical analysis the diagnostic groups (people with diabetes alone, people with diabetes and somatic co-morbidity and people with somatic diseases other than diabetes) are only compared with healthy adults with no known somatic disease (control). For comparisons reasons, data on people with other somatic diseases than diabetes will be presented.

Demographical (including gender, age, education, income) and lifestyle factors (including BMI and exercise) were controlled for in the analyses. Social support and sense of mastery were examined as potential moderating variables, and depression and anxiety were outcome variables. Please see the article (Gulbrandsen in prep.) for a more detailed description of how the variables were entered in SPSS.

Different coefficients are used to predict how well the model (set of predictors) predicts outcome (Bjørndal & Hofoss 2004). Cronbach alpha coefficient was used to assess to which degree the items in the scales used, measures the same underlying construct (internal validity). Pearson correlation coefficients' (r) is used to describe the strength and direction of the association within the independent variables. Multicollinearity test was used in order to assess correlation between the independent variables and the dependent variable. Hosmer and Lemeshow Test were used to assess the adequacy of model.

In the Health survey of Level of Living (2002) complete data were not obtained from all participants. In the statistical analysis only cases with complete data on all the variables included in the certain analysis are used, i.e. missings were excluded listwise.

2.5 Ethics.

The personal data obtained from the health survey on Level of Living (2002) is processed by statutory rules (Hougen & Gløbøden 2002). This means that Statistics Norway (SN), (that was responsible for gathering the data for interviews, postal questionnaires and linking it to public registries) has worked out guidelines for coupling of different data sources for statistical purposes. The guidelines are based on SN's authorisation given by the Data Inspectorate for person registries, and the Statistics Act. According to these guidelines responses given in surveys can only serve for the purpose of making statistics. As an example, information concerning groups of people will be given, not for individuals. When survey data files are coupled to registers, encryption techniques are used in order to ensure that it is impossible to identify persons from the survey or register information in the coupled data file. This information and linking to public registries was specified to the subject's in the informal letter (Appendix 5) prior of the interviews. Information about the aim and themes of the survey were also given in the letter and in a brochure that was sent in advance of the survey. If the subjects has not read the information prior to the interview, the interviewer will convey the subjects prior to the interview. Statistics Norway removed all reference to the personal identification number (PIN) prior to sending the data to the National Public Health Institute, thus rendering the data anonymous. Interviewer and people working at Statistics Norway have confidentiality. The data is kept under secure and restricted access at the National Public Health Institute and all analysis that were accomplished in regard to the present study were done there.

3.0 RESULTS

This chapter will give a brief summary of the results that is presented in more detail in the article (Gulbrandsen in prep.).

3.1 Results summary.

Totally 16.3% of people with diabetes alone report depression, and the same rate were seen for anxiety. Among people with diabetes and somatic co-morbidity 17.4% reported depression, and 11.6% anxiety. A total of 13.4% and 9.2% of people with other somatic diseases than diabetes reported respectively depression and anxiety. Relatively more people with diabetes and co-occurring somatic diseases, as well as people with somatic diseases other

than diabetes suffer from depression and anxiety, compared to healthy adults. The small sample size hinders concluding about significance levels since the variation for the group diabetes alone, is so large. Although not significant, there was a trend for higher levels of in particular anxiety in people with diabetes alone. These findings are presented in Figure 1 and 2 in the article (Gulbrandsen in prep.).

People with diabetes alone were significantly associated with a 2 times greater odds ($p=0.054$) for depression, compared to healthy adults. Sense of mastery served as a coping resource that reduced related depression. This group was in addition associated with a 3 times greater odds for anxiety, compared to healthy adults. Sense of mastery slightly decreased the associated odds. People with diabetes and somatic co-morbidity had 2 times greater odds for having depression and anxiety compared to healthy adults. Sense of mastery, protected against both conditions, but social support protected only against anxiety.

4.0 DISCUSSION

This section is an elaboration of the discussion in the article. First, strengths and limitations in reference to reliability and validity of the study will be introduced. This will be followed by a discussion on why people with diabetes suffer relatively more from depression and anxiety compared to people with no known somatic diseases (healthy adults), and with a following discussion on sense of mastery and social supports ability to serve as coping resources that can reduce anxiety and depression among people with diabetes.

4.1 Reliability.

The Hopkins Symptoms Check List-25 (HSCL-25) was used to assess psychological distress in the present study. To test the reliability of the subscales concerning anxiety and depression, internal consistency was assessed. Internal consistency means the degree to which the items that make up the HSCL-scales are all measuring the same underlying attribute (Shadish et al. 2002).

Internal consistency was assessed by using the coefficient alpha. Values range from 0 to 1, with higher values indicating greater reliability (Cronbach 1951). A level greater than .7 is given as an adequate alpha (Schmitt 1996). Cronbach's alpha can be considered satisfactory since the subscales for depression and anxiety respectively had value of .91 and .84. Cronbach's alpha values are dependent on the number of items in a scale (Cronbach 1951). Fewer items than 10 in a scale predict alpha values to be relatively small. The slightly lower

Cronbach's alpha in the subscale concerning anxiety (10-items) compared to depression (15-items) can therefore be explained by this argument. Note, the coefficient alpha is still high, indicating internal validity and high reliability. Other studies have also stated that the HSCL-25 battery has satisfactory reliability as a measure of psychological distress (Derogatis et al. 1974; Glass et al. 1978).

Internal consistency was also examined for the 5 items measuring sense of mastery giving adequate value (Cronbach's alpha 0.86). Cronbach's alpha for the OSS-3 scale measuring social support was not reported, because the index has a multidimensional structure (measuring support from family and friends, neighbours and support as numbered) that will lead to inadequate Cronbach's alpha (Dalgard et al. 2006).

4.2 Validity.

Validity is the approximate truth of an inference and underlies the approach to generalized causal inference (Shadish et al. 2002). One can never be certain that all of the many inferences drawn from the present study or the article (Gulbrandsen et al. in prep.) alone are true. The validity of the HSCL-25 scale refers to the degree to which it measures psychological distress. Empirical findings and the consistency of these findings with other sources such as earlier findings and theories can substantiate its validity (Shadish et al. 2002). Derogatis and colleagues (1974) and Glass and colleagues (1978) have reported the HSCL-25 battery as a reliable measurement of psychological distress (Derogatis et al. 1974; Glass et al. 1978). Validity can be divided into statistical conclusion validity, construct validity, and internal and external validity, representing various degrees of validity defined by Shadish, Cook and Campbell 2002.

4.2.1 Statistical conclusion validity.

Statistical conclusion validity is the degree to which conclusions reached about relationships between variables are justified (Shadish et al. 2002). In the present study it concerns the conclusion reached about the association between diabetes and psychological distress. It involves ensuring adequate sampling procedures, appropriate statistical tests, and reliable measurement procedures (Shadish et al. 2002).

The sample in the present study was nationally representative, ensuring an adequate sample foundation. Correlation analysis by Pearson rho and a multicollinearity test were carried out

before regression analyses. This was done to see which, if any, of the predictors were very highly correlated. If two predictors are perfectly or highly correlated, then the values of b for each variable are interchangeable which can be a problem. This can be indicated by estimates of regression coefficients giving values very different from those we might expect. The problem can be solved by dropping one of the pair causing high correlation. On the other hand, if the predictors under study were not related to the dependent variable, it would not be of interest to include them in the study. The correlation analysis where done prior of statistical analysis, showed satisfying values, which strengthens the statistical conclusion validity (Shadish et al. 2002).

Other statistical tests that were applied showing adequate values were Homer and Lemeshow Test and Cronbach's alpha.

Threats to statistical conclusion validity are type I and type II error. Type 1 error refers to the probability of false positive conclusion, that is a measured significance is in fact not significant. The p -value ($<.05$) selected in the article represent the maximum risk (5%) attending false positive conclusion. The smaller the p -value, the less likely it is to make false positive conclusion (Bjørndal & Hofoss 2004). If choosing a stricter level as i.e. 99% confidence level ($p<0.01$) one can decrease the risk of type I errors, but one can also miss promising trends that might have been worth following up with further investigations. The statistical level ($p<0.05$: 95% CI) is reported to be more common (Gardner & Altman 1986).

Type II error represents the opposite, the probability of false negative conclusion, that is a measured not significance is in fact significant. Small sample size increases the probability for type II error (ibid.). The sample in the present study consist off a large sample ($n=6758$), resulting in increased number of control participants, which strengthening the statistical power by reducing the probability of both type 1 and type II error (Bjørndal & Hofoss 2004). However, the population was distributed into four groups, leading to a small group of people with diabetes alone ($n= 43$). This choice was taken due the potential bias of somatic co-morbidity. The small sample size results in estimates based on a small proportion of information that may not reflect the underlying population and cause random variation. This decreases the statistical power, and effect size estimates will be less precise reflected by wider confidence intervals. Figure 1 and 2 in the article (Gulbrandsen et al. in prep.) reflect this variation.

Issues tied to the implementation of the regression discontinuity design concern adherence to the cut-off when assigning participants to conditions (Shadish et al. 2002), such as high or low symptoms of depression/anxiety used in the present study. A consideration is that if the participants are confined to a narrow range around the cut-off point, i.e. scores for symptoms of depression of 1.70-1.75 (cut-off point was 1.75) participants within that range will be classified as healthy, when they perhaps should be classified as having “high symptoms of depression”. The use of cut-off points do not take into consideration the fuzzy zone around borderline and may lead to misclassified participants and less accurate (valid) estimates.

In a study conducted by Nettelbladt and colleagues in 1993 characteristics of the HSCL-25 was tested. Results revealed that the cut off point of ≥ 1.75 (selected in the present study) as predictor for high symptoms of depression/anxiety yielded a lower number of false-positives (19%) than the cut-off point of ≥ 1.55 (43%). The number of false-negatives for the two cut-off points differed only slightly (2 vs 5%). This substantiates the validity of 1.75 as cut off point in the HSCL battery used in the present study. In addition, scores ≥ 1.75 are valid predictors of psychological distress in accordance to several studies (Nettelbladt et al., 1993; Strand et al., 2003). Cut-off points for sense of mastery 5-items scale and Oslo Social Support Scale are all widely used (Lavikainen et al. 2006; National Institute for Health and Welfare n.d.).

A helping card to provide valid estimates concerning disease questions was used in the Health survey of Level of Living (2002). This helping card may help recall of diseases and promote valid answers concerning diseases and prevent misclassification. Measurements error weakens the association between disease and psychological distress, and can strengthen or weaken the relationship with other variables included in the analysis.

Response to the postal questionnaire (comprising the HSCL-battery) was relatively equal across the four groups, ranging from 76.2%-79.8% (see Table 3). The variation in prevalence for related depression and anxiety across the groups was therefore not due to the potential bias of response, suggesting response validity of the psychosocial variables in the postal-questionnaire.

Data in the present study were obtained by interview with pc-based registration of data. An important advantage by using PC-based registration is that pre-programmed skipping of questions was employed in order to avoid asking questions to respondents that are inappropriate. PC-assisted interviewing gives the opportunity to monitor response consistency between the different questions directly. In addition, error messages are programmed in order to alert the interviewer when typing values that are not consistent with previous responses. This validates the participants answer by avoid entering invalid input and results in reduced non-response on certain questions by reduced risk for skipping questions that should have been raised.

Errors may occur when respondents give wrong answers. One reason is that questions may be misunderstood, or when questions relate to issues people find complicated, one must expect that erratic responses may be found. Data collection errors may also come from questions respondents find sensitive. In such cases, respondents may intentionally reply incorrectly. Responses may also be influenced by what the respondent consider socially desirable as mentioned. Taken together, the pc-based registration procedure is suggested to strengthen participants answer.

4.2.2 Construct validity.

Construct validity refers to the extent to which operationalizations of a construct do actually measure what the theory says they do (Shadish et al. 2002).

Self-reported questionnaire can have an impact on the participants answer, due to bias of emotional status or characteristics. This problem can occur in the HSCL-25 measuring depression and anxiety, the 5 items measuring sense of mastery, the social support index and lifestyle included in the postal questionnaire. On the other side, if HSCL-25 was presented orally or by a clinical interviewer to assess psychological distress, bias may occur due to social desirability (King & Bruner 2000) resulting in lower scores for symptoms of depression and anxiety. Questions concerning disease were presented orally by the interviewer, either by phone or by home visit. People may say these are also questions of sensitive matters, which could lead to social desirable bias in this setting. To prevent desirable bias to occur the survey used a helping card listed with 59 diseases (Hougen & Gløboden 2002), which can contribute to attenuate the sensitive question and validate the disease question.

Furthermore, the HSCL-25 scale has also been examined in order to evaluate its accuracy in detecting psychological distress compared to the accuracy of a physician (Hesbacher et al. 1980). Results showed a high concordance between the “cases” assessed by the two measuring procedures, which strengthens the construct validity of the HSCL-25 scale as a screening instrument for psychological distress.

The 5 items measuring sense of mastery and the social support index are widely used in Europe, indicating good construct validity (Lavikainen et al. 2006).

The measurement of psychological distress has a limitation that needs to be born in mind. Their nature variability inherent (Derogatis et al. 1974), which can reflect relatively transient symptom behaviours, makes it inconvenient to make the same rigorous demands regarding score stability as can other areas of psychological measurement, e.g. intellectual abilities. Hopkins Symptom Check list has been assessed in term of sensitivity, specificity and predictive ability by several studies (Sandanger et al. 1998; Strand et al. 2003; Veijola et al. 2003), all supporting the scale as a relatively stable screening instrument for psychiatric disorders.

If a study contains construct error, it risk misleading both theory and practice (Shadish et al. 2002). By theory, means empirical conclusions. Error of the construct could therefore lead to misleading information, i.e. regarding “cases” with related psychological distress among people with diabetes. This could further on lead to inappropriate practice. However, HSCL-25 is a widely used self-administrated screening instrument for detecting psychological distress (Strand et al. 2003), the scale has reported high quality in different languages (Nettelbladt et al. 1993; Veijola et al. 2003; Ventevogel et al. 2007), and good sensitivity, specificity and accuracy as mention, indicating that the instrument will not mislead theory or practice. Another consideration regarding construct validity is that it carries and shapes debate (Shadish et al. 2002), for instance within public health. Low construct validity could in general, lead to poor debates, in appropriate public health initiatives and incorrect public health literacy. Taken together, findings suggest good support for construct validity for the HSCL-25 scale, sense of mastery (5-items) and the social support index.

4.2.3 Internal validity.

Internal validity refers to inferences about a causal relationship between variables (Shadish et al. 2002). The current study uses a cross – sectional design, which has strengths and limitations in its nature. The method can be standardized, and it allowed the present study to examine several variables at the same time (Aalen et al. 2006). On the other hand, the cross-sectional study design limits the possibility to estimate the risk of diabetes and psychological distress or draw causal inferences. However, the study can only describe associations between diabetes and psychological distress.

4.2.4 External validity.

External validity concerns the extent to which the (internally valid) results of a study can be held to be true for other cases, for example to different people, places or times (Shadish et al. 2002) In other words, it is about whether findings can be validly generalized. A major factor concerns whether the study sample (e.g. the research participants) is representative of the general population along relevant dimensions. In the present study the sample was nationally representative with a large sample (n=5396) (Hougen & Gløbøden 2002), however, because non-response differs unequally among the different variables used in the present study, the sample will not be fully representative regarding obtained information on the variables. In order to adjust for this type of bias, the population that had responded to both interview and postal questionnaire were included in the present study (N=5396), constituting 70.8% of all participants (N=7624). Additionally, missing data excluded casewise, resulting in that only cases with complete data were used in the statistical analyses.

Random assignment, within the limits of sampling error, simplifies that the association observed in the sample will be the same as the association would have been observed in any other random sampling of persons of the same size from the same population, and additionally across all other persons in the Norwegian population who were not in the original random sample. Repeatedly, the small sample size of people with only diabetes prevents the group to reflect the underlying population, due to high sample variation.

The predicted exponential rise in diabetes incidences annually, will affect the estimated prevalence rates of diabetes and will therefore inhibit the strength of external validity, since

data were obtained in 2002. Additionally, whether the association is addressed T1D or T2D is not known in the present article, which also limits the external validity of the study.

4.3 Diabetes and related psychological distress.

The aim of the present study was to examine the association between diabetes, either alone or with somatic co-morbidity and psychological distress in the adult Norwegian population, and to explore to what extent the association was modified by sense of mastery and social support.

The article by Gulbrandsen and colleagues (in prep.) suggests that people with diabetes and simultaneous somatic co-morbidity are suffering relatively more from anxiety and depression than the healthy population without a known somatic disease. Among this group, a total of 17.4% reported depression and 11.6% reported anxiety. These findings are discussed thoroughly in the article (Gulbrandsen et al., in prep.), stating reasons such as the elevated psychological burden of having several chronic diseases (Gili et al. 2010), the psychological burden of living with chronic diseases, high self-care regime, and the high reported low sense of mastery (50%) and low social support (32%) to be exemplifications. In addition, the article (Gulbrandsen et al., in prep.) suggests a high trend (although only borderline significant) for depression and especially anxiety among people with diabetes alone, where this group was characterized with low sense of mastery (32%)

4.4 The modifying role of sense of mastery and social support.

Sense of mastery and social support (from friends, family and neighbours) were examined as potential coping resources that could reduce depression and anxiety among people with diabetes, either alone or with simultaneous somatic co-morbidity. Social support eliminated the associated odds related to anxiety among people with diabetes and co-morbidity. It was speculated in the article that social support could facilitate the self-care process indirectly (i.e. occasional advise, emotional support, proper environment) and directly (i.e. managing medication). This type of social support could give further beneficial effects as motivation, coping and psychological well being further indicate that social support can serve as a coping resource that reduces anxiety.

The article (Gulbrandsen et al. in prep.) suggests support for the theory that sense of mastery can serve as a coping resource that can reduce experienced anxiety and depression among people with diabetes and somatic co-morbidity. Reasons stated are that sense of mastery enables people to use preventive care, have good health behaviours', seek treatment early, use

health services properly, increase adherence to health promotion interventions and mobilize personal resources and coping strategies. People experiencing adequate self-management, for example by self-monitoring of blood glucose, will feel more self-confident. Sense of mastery as a coping resource did not have the same effect among people with somatic diseases other than diabetes. This can be understood by the specific characteristics of diabetes. Self-care management and day-to-day care monitoring of the disease are prominent features in diabetes.

A more detailed discussion is presented in the article (Gulbrandsen et al. in.prep.). Therefore will factors such as the severity of diabetes and duration (that were not assessed in the article), be discussed related to their possible affect on the association between diabetes and psychological distress.

4.5 Severity and duration, diabetes and co-morbidity.

The present study considers the possible bias from co-occurring somatic diseases, including diabetes associated diseases such as cardiovascular morbidity (American Diabetes Association 2012). Results suggest that people with diabetes alone report higher sense of mastery compared to people with diabetes and somatic co-morbidity (Table 1 in the article). This can indicate that the buffer effect of sense of mastery is confined to people with less severe or uncomplicated diabetes. This would be in accordance with results from previous research providing evidence that people with low adherence to the self-care process are likely to suffer more complications and more severe diseases, and as a result are more vulnerable to depression (Cienchanowski et al. 2000), which was suggested in the article (Gulbrandsen et al. in prep.).

Further more, with increased severity of diabetes the treatment regime increases (American Diabetes Association 2012), like insulin or oral tablets, or adherence to physical activity and diet, or both. Explained in another way, the severity of diabetes is also an indication of the degree self-care activities are needed daily to cope with diabetes. People with a severe type of diabetes may therefore constitute a larger proportion of those who reported low sense of mastery in the present study, than people with less severe diabetes with a less self-care burden. This is supported by a previous study that revealed that people treated with insulin report higher diabetes-related anxiety (Delahanty et al. 2007). Further more, this can also suggest that people with less severe diabetes benefit from social support from family and

friends, due to their potential to facilitate adherence to physical activity and diet when the self-care burden is less.

Anxiety and depression among people with diabetes (T2D) has also been demonstrated to stem from (in addition to self-care demand) concerns and worries associated with characteristics of diabetes such as the experience of more long-term complications (Fisher et al. 2007; Fisher et al. 2008; Fisher et al. 2009), which is common (American Diabetes Association 2012). Signals such as more intensive treatment regime, and poor glycemic control could signalize that a person's condition is deteriorating, leading to increased anxiety and depression. This can be the case for people with severe diabetes. Additionally, diabetes is a lifelong disease, and increased psychological distress may therefore occur (Jang et al. 2009). However, such relationships have also been found to be absent (Fisher et al. 2001), leading this discussion back to the theory presented in the article (Gulbrandsen et al. in prep.), where life events such as chronic diseases may over time erode coping resources increasing psychological distress (Scheiman & Turner 1998).

Moreover, it could be suggested that worries about increased BMI (controlled for in the present study) may be a source of higher levels of psychological distress. Consequently, poor glycemic control, more intensive diabetes treatment, long disease duration, high number of diabetes-related complications, co-morbidity and increased BMI are all important indicators of diabetes self-care burden that may influence the level of psychological distress among adults with diabetes.

4.6 Public Health Perspectives.

Today, many people in Norway live with the burden of the chronic disease diabetes (Diabetesforbundet 2011a; Diabetesforbundet 2011b). The disease requires daily self-care, it can lead to the development of long-term complications (Bahr 2009), co-morbidity (American Diabetes Association 2012), and related psychological distress (de Beurs et al. 2005; Luijendijk et al. 2008). In addition, the disease imposes large avoidable costs in human, social and economic terms (individuals, family health systems and countries). All together, these outcomes can increase the risk for people with diabetes to end up with sick leaves (Mykletun & Knudsen 2009), causing a large proportion of lost resources for the community, or as a worse case it can increase the risk of premature death. The present study suggests that coping

resources such as sense of mastery and social support can reduce the experience of anxiety and depression. The strategies for health promotions providers will therefore be to mobilize such coping resources as sense of mastery and social support, so that they can be more active and regain control over their condition (empowerment) (Sørensen & Graff-Iversen 2001). Empowerment refers to people's experience of coping with diabetes, which can promote self-care (Gallant 2003). However, the severity of diabetes (Cienchanowski et al. 2000) and disease duration (Fisher et al. 2001) can influence peoples' ability to cope. Furthermore, these factors will also (as discussed) influence the effect of coping resources such as sense of mastery and social support on related psychological distress.

Taken together, the study suggests that an individual approach is needed to promote diabetes management and prevent related psychological distress.

4.7 Perspectives for the future.

The present study suggests the need for further research concerning the mental health problems in people with diabetes. In particular emphasizes the need for distinguishing between T1D and T2D when examining related anxiety and depression for research in the future, while considering the potential bias of co-occurring somatic diseases in both control and disease group with an adequate sample size.

5.0 CONCLUSION

The present study suggests that relatively more people with diabetes and somatic co-morbidity suffer from depression and anxiety compared to control with no known somatic disease. A trend for depression and in particular for anxiety was found among people with only diabetes. Moreover, the study suggests that whereas people with only diabetes report symptoms of anxiety, those with diabetes and somatic diseases indicate depression and anxiety. Sense of mastery serves as a coping resource that can reduce depression among people with diabetes, with or without co-occurring somatic diseases. While, social support serves as a coping resource that can reduce anxiety among people with diabetes and co-occurring somatic diseases.

Individual disease characteristics, such as duration, severity, and the presence or absence of somatic co-morbidities emerge as factors that can influence the protective effect of sense of mastery and social support on psychological distress.

Taken together, diabetes and psychological distress are public health issues that need attention. The study suggests that health providers emphasize a life-centred, individual-focused approach to promote diabetes management, and prevent related psychological distress.

REFERENCES

- Aalen, O. O., Frigessi, A., Moger, T. A., Scheel, I., Skovlund, E. & Veierød, M. B. (2006). *Statistiske metoder i medisin og helsefag*. Oslo: Gyldendal Norsk Forlag AS.
- Achenbach, P., Warncke, K., Reiter, J., Naserke, H. E., Williams, A. J., Bingley, P. J., Bonifacio, E. & Ziegler, A. G. (2004). Stratification of type 1 diabetes risk on the basis of islet autoantibody characteristics. *Diabetes*, 53 (2): 384-92.
- American Diabetes Association. (2012). Standards of Medical Care in Diabetes. *Diabetes Care*.
- Arbeids- og inkluderingsdepartementet & Helse- og omsorgsdepartementet. (2007-2012). Nasjonal strategiplan for arbeid og psykisk helse.
- Bahr, R. (2009). *Aktivitetshåndboken*. Fysisk aktivitet i forebygging og behandling. Oslo: Helsedirektoratet.
- Bjørndal, A. & Hofoss, D. (2004). *Statistikk for helse- og sosialfagene*. Oslo: Gyldendal Norsk Forlag AS.
- Cienchanowski, P., Katon, W. & Russo, J. (2000). Depression and diabetes; Impact of depressive symptoms on adherence, function and costs. *Archives of Internal Medicine*, 160: 3278-3285.
- Clarke, D. M. & Currie, K. C. (2009). Depression, anxiety and their relationship with chronic diseases: a review of the epidemiology, risk and treatment evidence. *Med J Aust*, 190 (7 Suppl): S54-60.
- Cronbach, L. J. (1951). Coefficient Alpha and the Internal Structure of Tests. *Psychometrika*, 16 (3): 297-332.
- Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson, G., Ayuso-Mateos, J. L., Page, H. & Dunn, G. (2006). Negative life events, social support and gender difference in depression: a multinational community survey with data from the ODIN study. *Soc Psychiatry Psychiatr Epidemiol*, 41 (6): 444-51.
- de Beurs, E., Comijs, H., Twisk, J. W., Sonnenberg, C., Beekman, A. T. & Deeg, D. (2005). Stability and change of emotional functioning in late life: modelling of vulnerability profiles. *J Affect Disord*, 84 (1): 53-62.
- Delahanty, L. M., Grant, R. W., Wittenberg, E., Bosch, J. L., Wexler, D. J., Cagliero, E. & Meigs, J. B. (2007). Association of diabetes-related emotional distress with diabetes treatment in primary care patients with Type 2 diabetes. *Diabet Med*, 24 (1): 48-54.
- Derogatis, L. R., Lipman, R. S., Rickels, K., Uhlenhuth, E. H. & Covi, L. (1974). The Hopkins Symptom Checklist (HSCL): a self-report symptom inventory. *Behav Sci*, 19 (1): 1-15.
- Diabetesforbundet. (2011a). *Type 1-diabetes*. Available at: http://www.diabetes.no/no/Om_diabetes/Type_1-diabetes/ (accessed: 10.03.2012).
- Diabetesforbundet. (2011b). *Type 2-diabetes*. Available at: http://www.diabetes.no/no/Om_diabetes/Type_2-diabetes/ (accessed: 10.03.2012).
- Fisher, L., Chesla, C. A., Mullan, J. T., Skaff, M. M. & Kanter, R. A. (2001). Contributors to depression in Latino and European-American patients with type 2 diabetes. *Diabetes Care*, 24 (10): 1751-7.
- Fisher, L., Skaff, M. M., Mullan, J. T., Arean, P., Mohr, D., Masharani, U., R., G. & Laurencin, G. (2007). Clinical depression versus distress among patients with type 2 diabetes: not just a question of semantics. *Diabetes Care*, 30 (3): 542-548.
- Fisher, L., Skaff, M. M., Mullan, J. T., Arean, P., Glasgow, R. & Masharani, U. (2008). A longitudinal study of affective and anxiety disorders, depressive affects and diabetes distress in adults with type 2 diabetes. *Diabetic Medicine*, 25 (9): 1096-1101.

- Fisher, L., Mullan, J. T., Skaff, M. M., Glasgow, R. E., Arean, P. & Hessler, D. (2009). Predicting diabetes distress in patients with type 2 diabetes: a longitudinal study. *Diabetic Medicine*, 26 (6): 622-627.
- Gallant, M. P. (2003). The influence of social support on chronic illness self-management: a review and directions for research. *Health Educ Behav*, 30 (2): 170-95.
- Gardner, M. J. & Altman, D. G. (1986). Confidence intervals rather than P values: estimation rather than hypothesis testing. *Br Med J (Clin Res Ed)*, 292 (6522): 746-50.
- Gili, M., Comas, A., Garcia-Garcia, M., Monzon, S., Antoni, S. B. & Roca, M. (2010). Comorbidity between common mental disorders and chronic somatic diseases in primary care patients. *Gen Hosp Psychiatry*, 32 (3): 240-5.
- Glass, R. M., Allan, A. T., Uhlenhuth, E. H., Kimball, C. P. & Borinstein, D. I. (1978). Psychiatric screening in a medical clinic. An evaluation of a self-report inventory. *Arch Gen Psychiatry*, 35 (10): 1189-95.
- Gulbrandsen, K. E., Clench-Aas, J. & Raanaas, R. K. (in prep.). Diabetes and related psychological distress. The modifying role of sense of mastery and social support.
- Hesbacher, P. T., Richkels, K., Morris, R. J., Newman, H. & Rosenfield, H. (1980). Psychiatric illness in Family Practice. *Journal of Clinical Psychiatry*, 41 (1).
- Honeyman, M. C., Coulson, B. S., Stone, N. L., Gellert, S. A., Goldwater, P. N., Steele, C. E., Couper, J. J., Tait, B. D., Colman, P. G. & Harrison, L. C. (2000). Association between rotavirus infection and pancreatic islet autoimmunity in children at risk of developing type 1 diabetes. *Diabetes*, 49 (8): 1319-24.
- Hougen, H. C. & Gløbøden, M. A. (2002). Samordnet levekårsundersøkelse 2002 - tverrsnittundersøkelsen. Dokumentasjonsrapport. Oslo: Statistisk Sentralbyrå.
- Jang, Y., Chiriboga, D. A., Lee, J. & Cho, S. (2009). Determinants of a sense of mastery in Korean American elders: a longitudinal assessment. *Aging Ment Health*, 13 (1): 99-105.
- King, M. F. & Bruner, G. C. (2000). Social Desirability Bias: A Neglected Aspect of Validity Testing. *Journal of Psychology & Marketing*, 17 (2): 79-103.
- Lavikainen, J., Lehtinen, T. F. & Lehtinen, V. (2006). Improving Mental Health Information in Europe. *Proposal of the MINDFUL project*. Finland.
- Lazarus, R. S. & Folkman, S. (1984). *Stress, Appraisal, and Coping*. New York: Springer.
- Luijendijk, H. J., van den Berg, J. F., Dekker, M. J. H. J., van Tuijl, H. R., Otte, W., Smit, F., Hofman, J., Stricker, B. H. C. & Tiemeier, H. (2008). Incidence and Recurrence of Late-Life Depression. *Arch Gen Psychiatry*, 65 (12): 1394-1401.
- Mykletun, A., Overland, S., Dahl, A. A., Krokstad, S., Bjerkeset, O., Glozier, N., Aaro, L. E. & Prince, M. (2006). A population-based cohort study of the effect of common mental disorders on disability pension awards. *Am J Psychiatry*, 163 (8): 1412-8.
- Mykletun, A. & Knudsen, A. K. (2009). Psykiske lidelser i Norge: Et folkehelseperspektiv Nasjonalt Folkehelseinstitutt.
- National Institute for Health and Welfare. (n.d.). *Social support*. Available at: http://www.thl.fi/en_US/web/en/search?haku=Social+support&pikahaku=true (accessed: 10.04.2012).
- Nettelbladt, P., Hansson, L., Stefansson, C. G., Borgquist, L. & Nordstrom, G. (1993). Test characteristics of the Hopkins Symptom Check List-25 (HSCL-25) in Sweden, using the Present State Examination (PSE-9) as a caseness criterion. *Soc Psychiatry Psychiatr Epidemiol*, 28 (3): 130-3.
- Nield, L., Moore, H., Hooper, L., Cruickshank, K., Vyas, A., Whittaker, V. & Summerbell, C. D. (2009). Dietary advice for treatment of type 2 diabetes mellitus in adults. *The Cochrane Library* (1).

- Nolan, C. J., Damm, P. & Prentki, M. (2011). Type 2 diabetes across generations: from pathophysiology to prevention and management. *Lancet*, 378 (9786): 169-81.
- Orozco, L. J., Buchleitner, A. M., Gimenez-Perez, G., Roqué i Figuls, M., Richter, B. & Mauricio, D. (2008). Exercise or exercise and diet for preventing type 2 diabetes mellitus. *The Cochrane Library* (3): 1-14.
- Pearlin, I. L. & Schooler, C. (1978). The Structure of Coping. *Journal of Health and Social Behavior*, 19 (1): 2-21.
- Qi, L., Cornelis, M. C., Zhang, C., van Dam, R. M. & Hu, F. B. (2009). Genetic predisposition, Western dietary pattern, and the risk of type 2 diabetes in men. *Am J Clin Nutr*, 89 (5): 1453-8.
- Qiu, S. H., Sun, Z. L., Cai, X., Liu, L. & Yang, B. (2012). Improving patients' adherence to physical activity in diabetes mellitus: a review. *Diabetes Metab J*, 36 (1): 1-5.
- Sandanger, I., Moum, T., Ingebrigtsen, G., Dalgard, O. S., Sorensen, T. & Bruusgaard, D. (1998). Concordance between symptom screening and diagnostic procedure: the Hopkins Symptom Checklist-25 and the Composite International Diagnostic Interview I. *Soc Psychiatry Psychiatr Epidemiol*, 33 (7): 345-54.
- Scheiman, S. & Turner, H. A. (1998). Age, Disability, and the sense of mastery. *Journal of Health and social behavior*, 39 (3): 169-186.
- Schmitt, N. (1996). Uses and Abuses of Coefficient Alpha. *Psychological Assessment*, 8 (4): 350-353.
- Shadish, W. R., Cook, T. D. & Campbell, D. T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. New York: Houghton Mifflin Company.
- Strand, B. H., Dalgard, O. S., Tambs, K. & Rognerud, M. (2003). Measuring the mental health status of the Norwegian population: A comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nord J Psychiatry*, 57 (2).
- Sørensen, M. & Graff-Iversen, S. (2001). Hvordan stimulere tilhelsefremmende atferd. *Tidsskrift for Den norske legeforening*, 121 (6): 720-724.
- Taylor, E. S. & Stanton, L. A. (2006). Coping Resources, Coping Processes, and Mental Health. *The Annual Review of Clinical Psychology*, 3: 377-401.
- The Norwegian Institute of Public Health. (2011). *Diabetes*. Helsetilstanden i Norge/ faktaark. Available at: http://www.fhi.no/eway/default.aspx?pid=233&trg=MainLeft_5799&MainArea_5661=5799:0:15,2394:1:0:0:::0:0&MainLeft_5799=5544:70814::1:5800:4:::0:0 (accessed: 13.05.2012).
- van Dam, R. M., Rimm, E. B., Willett, W. C., Stampfer, M. J. & Hu, F. B. (2002). Dietary patterns and risk for type 2 diabetes mellitus in U.S. men. *Ann Intern Med*, 136 (3): 201-9.
- Vejjola, J., Jokelainen, J., Laksy, K., Kantojarvi, L., Kokkonen, P., Jarvelin, M. R. & Joukamaa, M. (2003). The Hopkins Symptom Checklist-25 in screening DSM-III-R axis-I disorders. *Nord J Psychiatry*, 57 (2): 119-23.
- Ventevogel, P., De Vries, G., Scholte, W. F., Shinwari, N. R., Faiz, H., Nassery, R., van den Brink, W. & Olf, M. (2007). Properties of the Hopkins Symptom Checklist-25 (HSCL-25) and the Self-Reporting Questionnaire (SRQ-20) as screening instruments used in primary care in Afghanistan. *Soc Psychiatry Psychiatr Epidemiol*, 42 (4): 328-35.
- Vermeire, E. I. J. J., Wens, J., Van Royen, P., Biot, Y., Hearnshaw, H. & Lindenmeyer, A. (2009). Interventions for improving adherence to treatment recommendations in people with type 2 diabetes mellitus. *The Cochrane Library* (1).
- World Health Organization. (2010a). Global Status Report on noncommunicable diseases.

- World Health Organization. (2010b). *Mental Health and Development: targeting people with mental health conditions as a vulnerable group*. Available at: http://www.who.int/mental_health/policy/mhtargeting/en/ (accessed: 11.03.2012).
- World Health Organization. (2012). *Health Topic: Global burden of diseases: 2004 Update*. Available at: http://www.who.int/topics/global_burden_of_disease/en/ (accessed: 10.03.2012).

Diabetes and related psychological distress. The modifying role of sense of mastery and social support

Karin Elisabeth Gulbrandsen ¹, Jocelyne Clench – Aas ² and Ruth Kjørsti Raanaas ¹

¹ Department of Plant and Environmental Sciences, Norwegian University of Life Sciences and ² Division of mental health, Norwegian Institute of public health.

Abstract

Objective: The aim of the present study is to examine the association between diabetes, with or without other co-occurring somatic diseases and psychological distress in the adult Norwegian population, and to explore to what extent the association is modified by sense of mastery and social support. **Methods:** Data were obtained from a cross-sectional health survey conducted in Norway 2002, where 6 827 people above the age of 15 years participated. People with diagnoses of diabetes alone or with simultaneous co-morbidity with somatic diseases, as well as people with somatic diseases other than diabetes, were compared to a group with no known somatic diseases. Data were obtained by self-reported questionnaire, interviews and public registries. Psychological distress was measured by Hopkins Symptoms Checklist-25. **Results:** Totally 16.3% with diabetes alone reported having depression and anxiety. This group was associated with 3 times greater odds for anxiety compared to healthy adults ($p < 0.01$), and 2 times greater odds for depression ($p = 0.054$). Sense of mastery, but not social support protected against depression for this group. A total of 17.4% of individuals with diabetes and co-morbidity reported depression, and 11.6% reported symptoms of anxiety. The odds for both were approximately 2 times greater than healthy adults ($p < 0.01$ and 0.05 respectively). Sense of mastery, but not social support protected in both conditions. **Conclusions:** The study suggests the need for further research concerning the mental health problems in people with diabetes. This study suggests that whereas people with only diabetes report symptoms of anxiety, those with diabetes and somatic diseases indicate depression and anxiety.

Keywords: Mental health, mental disorders, psychosocial resources, chronic diseases, self-reported questionnaire, HSCL-25

Introduction

Diabetes mellitus is a chronic disease (American Diabetes Association 2012), consisting of two main types, Type 1 diabetes (T1D) and type 2 diabetes (T2D). T1D is characterized by deficient insulin production due to an autoimmune reaction that leads to the destruction of beta cells in the pancreas (Bahr 2009). The situation requires daily administration of insulin to prevent the development of ketoacidosis, coma and death. T2D is characterized by both the body's ineffective use of insulin (due to insulin resisting cells) and ineffective insulin secretion.

Medical treatments are blood glucose lowering tablets or injected insulin. Both types are life threatening, and to live well with the disease, people need to integrate demanding self-care activities into their daily lifestyle, and learn to cope with the potential of diabetes complications and co-morbidity (American Diabetes Association 2012). Such self-care activities are long-term adherence to diet, physical activity, medication, blood glucose monitoring and smoking cessation.

Approximately 25.000 people have T1D in Norway, and 600 new cases are detected annually (Diabetesforbundet 2011a). For T2D there is approximately 350 000 having the disease in Norway, with 6000-7000 new cases detected annually (Diabetesforbundet 2011b). Diabetes is not only seen as an increasingly important condition nationally, but indeed also globally (Whiting et al. 2011). A total of 366 million people were calculated to have diabetes in 2011, and this number is expected to rise to 552 million by 2030.

Chronic somatic diseases are frequently associated with psychological distress, and the prevalence rate is seen to increase according to the number of somatic diseases (Gili et al. 2010). The association between diabetes and depression is reported in several studies (Anderson et al. 2001; Chang-Quan et al. 2010; Clarke & Currie 2009; Gavard et al. 1993). The review of Garvard and colleges (1993) are the only review article that specifically evaluates the association between diabetes and depression with the potential bias of co-morbidity in the diabetic group and control group.

A reciprocal interaction between diabetes and depression is suggested (Renn et al. 2011; Stuart & Baune 2012), although not supported by all (Engum 2007). Biological and physiological changes caused by diabetes, and the psychosocial burden of having a chronic disease is reported to on one hand contribute to the development of depression. On the other hand can depression cause unhealthy behaviour (hyper-caloric diet and lack of physical activity), which can lead to increase risk of diabetes.

The association between diabetes and anxiety is reported in a review by Clark and Currie (2009), showing that anxiety was present in 14% of patients with diabetes. Clark and Currie (2009) do not report in the study whether the potential bias of co-morbidity is taken into consideration. No reciprocal interaction between diabetes and anxiety is reported (Engum 2007). Factors reported to significantly increase the risk of developing anxiety are two or more chronic illnesses and poor sense of mastery (Smit et al. 2007).

Psychosocial resources, such as sense of mastery (Dalgard et al. 2007; de Beurs et al. 2005; Jang et al. 2002; Penninx et al. 1998) and social support (Bisschop et al. 2004; Korkeila et al. 2003; van Dam et al. 2005) are reported to protect against developing psychological distress. Sense of mastery is associated with self-management behaviors, preventative care and proper utilization of health care services, which is suggested to be reasons for its protective ability (Seeman & Seeman 1983; Skaff et al. 2003). In addition, individuals with high sense of mastery are more likely to be responsive to interventions for health promotion (DeSocio et al. 2003; Skaff et al. 2003). The risk of diminished sense of mastery on the other hand, is associated with an increase in both chronic conditions and functional disability (Jang et al. 2009).

A positive relationship between social support and the management of chronic diseases, especially for diabetes has been reported (Gallant 2003). However, the term social support is defined in various ways, and often associated with group sessions (van Dam et al. 2005). Social support from family and friends are reported to be a key element in the prevention and management of T2D, due to their possibility to increase adherence to physical activity (Qiu et al. 2012). Additionally, dietary behaviors also appears to be susceptible to social influences (Gallant 2003). Influence can be provided through occasional advice, emotional support, tangible support, and proper environments. Explained in another way, family and friends can indirectly facilitate self-care, for instance shop healthy food, promote smoking cessation or be an exercise partner.

The buffering effects of psychosocial resources are noted to differ between various chronic diseases (Bisschop et al. 2004; Penninx et al. 1998). This suggests the need of examining the potential buffering effects of psychosocial resources specifically regarding diabetes.

The aim of the present study is to examine the association between the chronic disease diabetes and psychological distress in a representative sample of the Norwegian population, and explore to what extent the association is modified by sense of mastery and social support. The research questions are: Do relatively more people with diabetes, with or without other co-

occurring somatic diseases suffer from anxiety and depression compared to people with no known somatic disease? Can sense of mastery serve as a coping resource that can reduce anxiety and/ or depression among people with diabetes, with or without other co-occurring somatic diseases? Can social support serve as a coping resource that can reduce anxiety and/ or depression among people with diabetes, with or without other co-occurring somatic diseases?

Methods

Design

The present study presents data from a cross-sectional health survey conducted in Norway 2002 by Statistic Norway (SN) (Hougen & Gløbøden 2002). A random sample of 10 000 subjects living at home over the age of 15 years was drawn to participate in the survey. The sample consisted of two subsamples, a main and a supplementary sample, each containing 5000 subjects. The main sample was drawn following SN's standard sample plan (Statistisk Sentralbyrå 2002), in which Norway is divided in 109 strata. The supplementary sample was drawn randomly from all of the Norwegians municipalities.

The sample in the current study is distributed into four groups: 1) Individuals with only diabetes, 2) individuals with diabetes and somatic co-morbidity, 3) individuals who don't have diabetes but have other somatic diseases, and 4) the control group, individuals with no known somatic disease.

The dependent variables are the two aspects of psychological distress, depression and anxiety. Independent variables that are potential moderators are sense of mastery and social support. Independent variables that are controlled for are demographics and lifestyle. Demographics include gender, age, education and income. Lifestyle includes physical activity and body mass index (BMI).

Participants and procedures

Subjects from the main sample and supplementary sample were interviewed (1/2 hour) by respectively home visits and by phone (Hougen & Gløbøden 2002). For the main sample phone interviews were also chosen if subjects refused visits or if the travel distance was considered too long (29.8%). A total of 6827 (89.5%) subjects accomplished interview, consisting of 3410 males and 3417 females. Subjects that were interviewed by phone were

sent additional material in the form of a “helping card”, which provided a list of 59 diseases. The purpose of the helping card was to increase the probability of equal answers in both samples, as well as to simplify a sensitive question. For the supplementary sample, subjects without phone were visited.

After the interview, all subjects, from both the main and the supplementary sample, received a postal questionnaire about health. The data on mental health and psychosocial variables were obtained by the postal questionnaire. Some subjects were lost from the sample after the interview (due to death, travel abroad, and institutionalization). Totally 7 624 subjects received the postal questionnaire. Among these, 6 192 subjects (81.2%); 2623 males and 2773 females responded. Non-responses were caused by language barriers, reservation from the survey or other reasons. A total of 5343 subjects responded to both interview and postal questionnaire. Information about education and household income were retrieved from national registries and linked to the data set.

In advance of the survey an informal letter and a brochure were sent to the subjects to inform about the aim of the survey and security of the confidentiality of the subject (Hougen & Gløbøden 2002). The survey was approved by The Data Protection Agency and personal data is processed by statutory rules. SN was responsible for gathering the data for interviews, postal questionnaires and linking it to public registries. All reference to the personal identification numbers were removed retrospectively. The data is kept under secure and restricted access at the National Public Health Institute.

Measuring instruments

Diabetes mellitus was measured with the following question: “Do you have, or have you had (i.e.) diabetes mellitus?” Responses were given in one of three categories (1= have, 2= have had, 3= have never had). This variable was recoded into reversed order. The alternative “having had” diabetes was excluded in the statistical analysis since the current study focus on symptoms of the chronic disease diabetes. More precisely, 13 subjects with diabetes alone and 55 subjects with diabetes and co-morbidity were therefore not included. Due to lack of information in the dataset concerning type of diabetes, distinguishing between T1D and T2D was not possible in this article. The participants were in fact not asked in the interview to specify type of diabetes. Hence, the term *diabetes* will be used further on in this article with reference to both types of diabetes.

Other somatic diseases are measured with the same type of question as above, but with a formulation referring to the disease of interest. Somatic diseases included in the current

study were; epilepsy, osteoporosis, angina pectoris, coronary heart disease, stroke, cancer, allergy, high blood pressure, metabolism disease, ankylosing spondylitis (previously known as Bekhterev's disease), arthritis, chronic bronchitis/emphysema/COPD, psoriasis, atopic eczema, urinary incontinence, fractures, removed organ, and ulcers.

Psychological distress was assessed with the Hopkins Symptom Check List (HSCL-25), measuring symptoms of anxiety and depression over the previous 14 days (Strand et al. 2003). It contains 25 items covering two sub-scales. Items 1-10 concerns symptoms of anxiety and items 11-25 concerns those of depression. Responses are given on a four-point scale (1 = not at all to 4 = extremely). In the present study, these subscales are dichotomized into “low” and “high” score with a cut off point at 1.75. Scores >1.75 are valid predictors of psychological distress in accordance to several studies (Nettelbladt et al. 1993; Strand et al. 2003). A “case” is accepted if no more than two items are missing from the items measuring depression or anxiety. For those with no more than two missing, data points, the mean values were substitute for the missing items. Cronbach’s alpha for the total HSCL-25 scale was .933; for depression it was .910 and for anxiety .844.

Sense of mastery was measured by the five-item version of the seven-item scale that was developed by Pearlin and colleagues (1981). These five items concerns experience of controlling and coping with life; 1. “I have little control over the things that happen to me”, 2. “There is really no way I can solve some of the problems I have”, 3. “There is little I can do to change many of the important things in my life”, 4. “I often feel helpless in dealing with the problems of life”, 5. “Sometimes I feel that I'm pushed around in life”. Responses were given with a five point scale (1 = agree, 5 = do not agree), which was recoded into 0 = “agree” and 4= “do not agree”. A sum score was calculated ranging from 0-20. The variable was dichotomized with a cut-off point of ≥ 12 resembling high sense of mastery in accordance with international use (Lavikainen et al. 2006). Cronbach’s alpha was 0.86.

Social support was measured by Oslo 3 Support Scale (OSS-3 scale) (Dalgard et al. 2006). It comprises 3 questions concerning number of close confidants, sense of concern or interest from other people, and relationships to neighbors. Close confidants were measured by the following question “How many people are so close to you that you can count on them if you have serious problems?” Corresponding scores were: 1. “no one”, 2. “1 or 2”, 3. “3-5” or 4. “more than 5”. Sense of concern and interest from other people was measured by the following question: “ How much concern do people show in what you are doing? Corresponding scores were: 1. “Great concern and interest”, 2. “ Some concern and interest”, 3. “slight concern and interest”, 4. “no concern and interest” and 5. “uncertain”.

Relationship to neighbors was measured by the following question: “How easy can you get practical help from neighbors if you should need it?” Corresponding scores were: “1. very easy”, 2. “easy”, 3. “possible”, 4. “difficult” and 5. “very difficult”. The corresponding scores in the two last questions were recoded into reversed order. In the present study the questions are merged into a social support index. The total score is calculated by adding up the scores for each item, ranging from 3-14. A score <9 is classified as poor support, a score between 9 and 11 as intermediate support, and a score between 12 and 14 as strong support (National Institute for Health and Welfare n.d.).

Gender and age were drawn from the interview section. Age was categorized into 4 groups (1= 16-24, 2= 25-44, 3= 45-67 and 4=>67 years and above) (Hougen & Gløbøden 2002). Education and income were linked from public registries. Education was categorized into 3 groups. Low education consisting of Primary School and Junior high School (year 1-10), middle education consisting of high school and first level of junior college without accomplished degree (year 11-14), and high education consisting of University or College (year 14-19) as well as PhD level (above 20 years) . Household income including the total income in the family was divided into quartiles (lowest quartile =0-199.999 NOK, 2nd quartile = 200.000-299.999 NOK, 3th quartile = 300.000-499.999 NOK and highest quartile = \geq 500.000 NOK).

Physical activity was measured by how many times per week the subject exercised (0= never, 1= less than 1/week and 2. 1/week or more). BMI was measured by kilograms/ height (m²) and classified into 6 categories (normal weight = BMI 18.5-24.9, underweight = BMI<18.5, overweight =BMI 25.0-29.9, class 1 obesity = BMI 30.0-34.9, class 2 obesity = 35.0-39.9, class 3 obesity = \geq 40.0). Physical activity and BMI are further on in this article referred to as lifestyle.

Statistical analysis

Stepwise Logistic regression was utilized with odds ratio (OR) as the estimated outcome with 95% confidence interval. People with diabetes either alone or with simultaneously co-occurring somatic diseases were compared to people with no known somatic diseases (control). The control group with no known somatic diseases will be referred to as *healthy adults* further on in this thesis, though only implied as somatic healthy adults. For comparison reasons, data are also presented for people with other somatic diseases than diabetes.

Hosmer and Lemeshow Test assessed the adequacy of the logistic model that showed good support.

Demographics and lifestyle factors (control variables) were all entered in one block, before entering sense of mastery and social support (potential moderators) separately stepwise. One analysis was also done where sense of mastery and social support were entered together in the same block. The purpose for stepwise logistic regression was to control for the variables predictive ability and effect on the association between diabetes and psychological distress (Bjørndal & Hofoss 2004). Depression and anxiety were entered as dependent variable in separate analyses. A moderating effect of sense of mastery and social support are assessed as a significant change in the odds ratio for the relationship between diabetes and psychological distress before and after inclusion of them.

Missing data excluded casewise, resulting in that only cases with complete data were used in the statistical analyses.

The results of Pearson correlation tests and multicollinearity tests were assessed before carrying out statistical analyses. Statistical analyses were conducted using the Statistical Package for the Social Sciences for Windows (SPSS, version 17).

Results

Table 1 presents the prevalence of response to the questions concerning depression, anxiety, sense of mastery, social support, demographics and lifestyle for the four diagnostic groups. Among the 5342 participants who responded to both interview and postal questionnaire, 181 reported being diagnosed with diabetes (3.4%), of which 138 reported additional co-morbidity (2.6%), and 43 subjects (0.8%) reported being diagnosed with diabetes alone. Totally 2925 participants (54.8%) had somatic diseases other than diabetes, and 2236 people (41.9%) constituted a control group with absence of a known somatic disease. A total of 598 participants (11.4%) having depression, comprising 7 subjects (16.3%) of people with only diabetes, 24 subjects (17.4%) of people with diabetes and co-morbidity, 392 subjects (13.4%) of people with diseases other than diabetes, and 175 (7.8%) subjects with no known somatic disease. A total of 405 subjects (7.6%) reported to have anxiety, comprising 7 subjects (16.3%) with diabetes alone, 16 subjects (11.6%) with diabetes and co-morbidity, 269 subjects (9.2%) with diseases other than diabetes, and 113 (5.1%) subjects with no known somatic disease. Totally 77.1% reported high levels of sense of mastery and 44.2% and 44% reported respectively medium and high level of social support. The mean score for sense of mastery and social support was respectively 19.5 (SD= 4.3; range 5-25) and 11.1 (SD = 1.82;

range 3-19). The mean score for depression and anxiety was respectively 1.33 (SD=0.4; range 1-4) and 1.27 (SD=0.35; range 1-4).

Relatively more people with diabetes and co-occurring somatic diseases, as well as more people with somatic diseases other than diabetes have depression (Figure 1) and anxiety (Figure 2), compared to the control group with no known somatic diseases. The small sample size hinders concluding about significance levels since the variation for the group diabetes alone, is so large. Although not significant, there is a trend for higher levels of especially anxiety in people with diabetes alone.

Predictors of Depression and Anxiety

Adjusting for demographics and lifestyle, people with diabetes alone were significantly associated with a 2 times greater odds ($p=0.054$) for depression (Table 2), compared to healthy adults. In the stepwise analysis, sense of mastery eliminated the significantly associated odds for depression. After inclusion of social support, no change in odds was found. After inclusion of both social support and sense of mastery, the associated odds for people with only diabetes and related depression were eliminated.

Adjusting for demographics and lifestyle, people with diabetes alone were significantly associated with a 3 times greater odds for anxiety (Table 3). Inclusion of sense of mastery slightly decreased the associated odds. After inclusion of social support, no change was found. After inclusion of both sense of mastery and social support, the associated odds were still significant.

Adjusting for demographics, with diabetes and co-occurring somatic diseases, were significantly associated with a 2 times greater odds for depression than healthy adults ($P<0.01$) (Table 2). In the stepwise analysis, no change in odds was found after inclusion of social support, but sense of mastery eliminated the association. After inclusion of both sense of mastery and social support, the association is absent. The odds for people with diabetes and co-occurring somatic diseases having related anxiety were statistical significant and almost 2 times greater than healthy adults (Table 3). In stepwise analysis and after inclusion of both sense of mastery and social support the association is absent.

People with somatic diseases other than diabetes had significantly almost 2 times greater odds for depression compared to healthy adults in the adjusted analysis (Table 2). In the stepwise analysis after inclusion of sense of mastery the odds decreased to 1.46, whereas inclusion of social support did not change the odds. Inclusion of both sense of mastery and social support decreased the odds to 1.35. Examining the association between anxiety and the

disease category somatic diseases other than diabetes, the adjusted odds were approximately the same as for depression (see Table 3). Inclusion of sense of mastery decreased the odds to 1.48, whereas inclusion of social support did not change the odds. Inclusion of both sense of mastery and social support resulted in somatic diseases other than diabetes being 1.5 greater than healthy adults ($P < 0.001$).

Discussion

The aim of the present study was to examine the association between diabetes, with or without other co-occurring somatic diseases and psychological distress in the adult Norwegian population, and to explore to what extent the association was modified by sense of mastery and social support.

The results from the present study suggest that relatively more people with diabetes and co-occurring somatic diseases were suffering from depression (17.4%), compared to healthy adults (7.8%) in Norway (See Fig. 1). Although not significant, there was a trend for reporting depression among people with diabetes alone (16.3%).

Lack of documentation in studies regarding relevant factors associated with diabetes, i.e. somatic co-morbidities that may have an impact on the reported prevalence, made it difficult to compare prevalence rates from the current study with other studies. In a review by Anderson and colleagues (2001), people with diabetes reported a slightly higher prevalence (21%) compared to the present study for related depression in Western countries. They did not report the depressed individuals by type of diabetes. The prevalence can therefore to some degree be comparable to the current study. However, they fail to report the potential bias of somatic co-morbidity, which was the essence in the current study. This could explain the elevated prevalence reported by Anderson and colleagues (2001). An earlier review by Gavard and colleagues (1993) considers the potential bias of co-morbidity in the association between diabetes and depression, but the review fails to present a precise prevalence from the included studies. The prevalence of related depression among people with diabetes, either alone or with co-occurring diseases and without distinguishing type ranges from 8.5-27.3% (Gavard et al. 1993).

The results from the present study suggest that relatively more people with diabetes and co-occurring somatic diseases were suffering from anxiety (11.6%), compared to healthy adults in Norway (see Fig. 2). Hence, the proportion was much lower than the reported

depression in this group. Although not significant, there was a trend for higher levels of anxiety among people with diabetes alone, compared to healthy adults (16.3%).

Two studies that examined T2D and T1D separately in 2002 and 2006, found a higher average prevalence of co-morbid anxiety among adults with T2D (11%) compared to adults with T1D (7.6%) (Shaban et al. 2006; Thomas et al. 2003). Here again, it can be speculated that related anxiety may be mainly a factor related to T2D.

A larger sample size is needed to assess whether relatively more people with diabetes alone suffer from depression and anxiety compared to the healthy adults.(Bjørndal & Hofoss 2004).

Results from the current study found that people with diabetes, with or without co-occurring somatic diseases, were associated to a greater extent with depression than the healthy Norwegian population (See Tabl. 2). This is in accordance with earlier studies (Anderson et al. 2001; Chang-Quan et al. 2010), showing similar odds for depression among people with diabetes. In according to Renn and colleagues (2011), the elevated odds for depression can be explained by the psychological burden of having a chronic disease. In addition, the associated biochemical change with diabetes, causing arousal of the nervous system can be another reason for related depression among people with diabetes (Renn et al. 2011).

Among people with diabetes, with or without co-occurring somatic diseases, sense of mastery as a coping resource eliminated the significantly associated odds for depression. This indicates that sense of mastery is a protective factor against depression. Among people with somatic diseases other than diabetes, sense of mastery was not a protective factor. These findings suggest that sense of mastery is especially an important coping resource for people having diabetes and related depression. Increased coping skills and adherence to health promotion interventions are suggested to explain the beneficial effect of sense of mastery (DeSocio et al. 2003; Moos et al. 2003; Seeman & Seeman 1983; Skaff et al. 2003; Thoits 1987). In the current study, more than 80% of the healthy adult population reported high sense of mastery. This supports the decreased probability of experiencing psychological distress in this group. On the other hand, people with diabetes, with or without co-occurring somatic disease reported more than twice as many people with low sense of mastery than the healthy population (See Table 1), respectively 40% and 30% reported low sense of mastery. This indicates that a large proportion of people with diabetes, especially with simultaneous co-occurring somatic diseases do experience more difficulties adhering to treatment regimens (American Diabetes Association 2012), or to cope with the disease, thereby resulting in

higher levels of depressive symptoms. Jang and colleagues (2009) reported that increase in both chronic conditions and functional disability posed a threat to sense of mastery. The reported higher prevalence of low sense of mastery among people with diabetes and co-occurring somatic diseases compared to people with diabetes alone, can be explained by Jang and colleagues (2009) findings. This highlights a need to promote sense of mastery among people with diabetes to reduce related depression.

Low social support is reported to elevate the perceived psychological burden of a chronic disease (Renn et al. 2011), leading to increased depression. However, social support from family, friend and neighbors did not serve as an important coping resource that could reduce depression. This indicated that other types of social support might instead serve as a coping resource that can reduce depression among people with diabetes.

The results from the present study suggests that people with diabetes, with or without co-occurring somatic disease were associated with anxiety to a larger extent than the healthy population. Though, primary associated with people with diabetes alone (see Table 3). Repeating, this can be due to that they do not experience to cope with the disease. In a review by Clarke and Currie (2009) anxiety is not reported to be common among people with diabetes, but rather in other somatic diseases (heart disease, stroke and cancer). This states a reason to question diabetes as a contributor to the observed greater odds for anxiety among people with diabetes and somatic-co-morbidity in the current study.

Results from the current study suggest that sense of mastery can serve as a coping resource that can reduce anxiety among people with diabetes and co-morbidity. Even though the odds slightly decreased for people with diabetes alone, a protective effect could not be concluded, since the significantly associated odds were still present after inclusion of sense of mastery (see Table 3). Social support from family, friends and neighbors did serve as a coping resource that could reduce related anxiety among people with diabetes and co-occurring somatic diseases, but not for people with diabetes alone. Why the protective effect only occurred in one condition, can be explained by that social support could be considered more important when having several chronic diseases that increases the self-care burden (Gallant 2003). Studies have also suggested that social support from family, friends and neighbors could facilitate the self-care process, and increase adherence to physical activity and healthy dietary behaviors (Qui 2012 and Gallant 2003), that can increase coping of diabetes and reduce anxiety. In addition, it seems like social support as a coping resource is primary linked to anxiety, and not depression. A relatively large proportion of people with co-occurring somatic disease reported low to middle social support (68%) (Table 1). Additionally, the prevalence of

reporting low social support in this group was twice as high compared to healthy adults. This highlights a need to promote social support in this group to reduce related anxiety.

It appears in the current study that the presence of related distress depends on the characteristics of the disease development. The study suggests that people with diabetes alone are in an early stage of the disease development, without complications or somatic co-morbidity, where it could be more common to experience anxiety. On a later stage in the disease developments, people may have developed long term complications or even simultaneous co-occurring somatic diseases that may lead these people into depression instead of anxiety.

The results did not suggest a synergistic effect after inclusion of both social support and sense of mastery on the association between diabetes and psychological distress.

The most effective components of social support (friends, family or neighbors), or the optimal amount of support remains unanswered questions.

The potential reciprocal interaction between diabetes and psychological distress was not assessed in the current study. Therefore it will not be discussed to a larger extent than to mention the potential bias of depression being a risk factor for diabetes instead of a consequence (Renn et al. 2011; Stuart & Baune 2012).

Strengths and limitations

The present study is based on data from a cross-sectional study, which restricts the ability to draw causal inferences concerning the direction of the association between diabetes and psychological distress. This cross-sectional study relies on retrospective reports of known somatic diseases. Recall of diseases, particularly when a long time period is involved, can lead to false-negative results (i.e. underreporting due to forgetting) (Raphael 1987). Another considerable limitation is the utilization of self-report as an assessment tool for psychological distress and physical health, rather than independent verification by a medical professional. Because self-reports are subject to individuals' emotional status or characteristics, it is possible that the association between diabetes and psychological distress may be overstated to some degree. On the other, hand it is worth noting that if the questions were presented orally by an interviewer, a much lower score on the HSCL-25 could have occurred due to a social desirability bias (King & Bruner 2000). The inability of the study to distinguish between T1D and T2D in the sample limits the possibility of more detailed knowledge about the two groups. This omission is also seen in other studies (Anderson et al. 2001). The survey was conducted in 2002 and some changes may have occurred. The small sample size (n=54) of the

individuals diagnosed with only diabetes and the large number of predictors are an additional issue in reference to the analysis. Genetic and environmental factors that may interact with the association between diabetes and psychological distress, are not addressed in this study is.

The study is based on a large and nationally representative sample, with a high response rate (70.4%). The reason why data from 2002 was used in the present study was because this was the only time in recent years a helping-card was provided in a large scale health survey, increasing the reliability of the questions concerning diseases. The measuring instrument HSCL-25 has been widely used in Norway to identify mental health problems and their relations to psychosocial risk factors (Sandanger et al. 1998).

Conclusion

The present study suggests that relatively more people with diabetes and somatic co-morbidity suffer from depression and anxiety compared to control with no known somatic disease. A trend for depression and in particular for anxiety was found among people with only diabetes. Moreover, the study suggests that whereas people with only diabetes report symptoms of anxiety, those with diabetes and somatic diseases indicate depression and anxiety. Sense of mastery serves as a coping resource that can reduce depression among people with diabetes, with or without co-occurring somatic diseases. While, social support serves as a coping resource that can reduce anxiety among people with diabetes and co-occurring somatic diseases.

Taken together, the findings emphasize the need for an individual-focused approach to promote diabetes management, and prevent related psychological distress

The present study suggests the need for further research concerning the mental health problems in people with diabetes. In particular emphasizes the need for distinguishing between T1D and T2D, while considering the potential bias of co-occurring somatic diseases in both control and disease group with adequate sample sizes in order to examine related anxiety and depression.

Table 1

Present the prevalence N (%) of response of the diagnostic groups on the questions concerning depression, anxiety, sense of mastery, social support, demographics and lifestyle.

Variables	Response alternatives	Control-group (N = 2858) Number of responses N (%)	No diabetes, but other somatic diseases (N = 3666) Number of responses N (%)	Only diabetes (N = 54) Number of responses N (%)	Diabetes with co-morbidity (N = 181) Number of responses N (%)
Outcome variables					
HSCL-depression	Normal >1.75	2034 (92.1) 175 (7.9)	2477 (86.3) 392 (13.7)	35 (83.3) 7 (16.7)	109 (82.0) 24 (18.0)
HSCL-anxiety	Normal >1.75	2101 (94.9) 113 (5.1)	2608 (90.6) 269 (9.4)	35 (83.3) 7 (16.7)	119 (88.1) 16 (11.9)
Moderating variables					
Sense of mastery	Low High	322 (14.6) 1879 (85.4)	732 (25.6) 2132 (74.4)	14 (32.6) 29 (67.4)	56 (42.1) 77 (57.9)
Social support as 3 item (categorized)	Low <9 Medium 9-11 High 12-19	178 (6.5) 1281 (46.5) 1297 (47.1)	356 (10.2) 1604 (45.9) 1532 (43.9)	4 (7.4) 31 (57.4) 19 (35.2)	32 (19.4) 81 (49.1) 52 (31.5)
Demographic variables					
Gender	Male Female	1548 (54.2) 1310 (45.8)	1699 (46.3) 1967 (53.7)	35 (64.8) 19 (35.2)	91 (50.3) 90 (49.7)
Age	15-24 25-44 45-66 ≥67	464 (16.2) 1258 (44.0) 945 (33.1) 189 (6.6)	418 (11.4) 1197 (32.7) 1387 (37.9) 659 (18.0)	7 (13.0) 19 (35.2) 12 (22.2) 16 (29.6)	3 (1.7) 24 (13.3) 86 (47.5) 68 (37.6)
Education	Low Middle High	371 (13.5) 1579 (57.3) 806 (29.2)	699 (19.6) 2009 (56.3) 859 (24.1)	14 (26.4) 29 (54.7) 10 (18.9)	61 (34.5) 88 (49.7) 28 (15.8)
Household income (quartiles)	Lowest quartile 2 nd quartile 3 rd quartile Highest quartile	518 (18.2) 508 (17.8) 1241 (43.6) 582 (20.4)	837 (22.9) 739 (20.2) 1478 (40.4) 605 (16.5)	12 (22.2) 17 (31.5) 18 (33.3) 7 (13.0)	60 (33.1) 46 (25.4) 54 (29.8) 21 (11.6)

Lifestyle variables					
Nr. Of days exercise/week	Never	662 (23.2)	954 (26.0)	19 (35.2)	72 (39.8)
	<1/week	334 (11.7)	387 (10.6)	4 (7.4)	10 (5.5)
	≥1/week	1854 (64.9)	2315 (63.1)	31 (57.4)	98 (54.1)
BMI categorized	Normal	1679 (60.4)	1860 (52.6)	31 (58.5)	52 (29.9)
	Underweight	58 (2.1)	63 (1.8)	0 (0.0)	4 (2.3)
	Overweight	889 (32.0)	1270 (35.9)	18 (34.0)	74 (42.5)
	Obesity	136 (4.9)	284 (8.0)	2 (3.8)	34 (19.5)
	Obesity class 2	14 (0.5)	46 (1.3)	2 (3.8)	6 (3.4)
	Obesity class 3	2 (0.1)	12 (0.3)	0 (0.0)	4 (2.3)

Note₁: Prevalence is based on the population responding to either postal questionnaire or interview, or both (N = 6759).

Table 2

Stepwise logistic regression examining the association between people with only diabetes, diabetes with co-morbidity, other somatic diseases and symptoms of depression compared to healthy adults (control) with no known somatic disease (N = 5396).

Disease	N	OR adjusted ^a (95% CI)	P	OR adjusted ^{ab} (95% CI)	P	OR adjusted ^{ac} (95% CI)	P	OR adjusted ^{abc} (95% CI)	P
No known somatic disease	2858	1		1		1		1	
Other somatic diseases	3666	1.707 (1.393-2.091)	<0.001	1.469 (1.176-1.836)	<0.001	1.675 (1.358-2.065)	<0.001	1.432 (1.139-1.801)	<0.001
Only diabetes	57	2.300 (.986-5.366)	0.054	1.844 (.714-4.763)	.206	2.336 (.991-5.506)	.052	1.895 (.738-4.871)	.184
Diabetes with co-morbidity	181	2.174 (1.310-3.605)	<0.01	1.464 (.835-2.570)	.184	2.034 (1.204-3.433)	<0.01	1.353 (.761-2.406)	.303

Note₁: Estimates are based on the population responding to both postal questionnaire and interview.

^a OR adjusted for socio-demographic variables and lifestyle

^b OR adjusted for sense of mastery

^c OR adjusted for social support

Table 3

Stepwise logistic regression examining the association between people with only diabetes, diabetes with co-morbidity, other somatic diseases and symptoms of anxiety compared to healthy adults (control) with no known somatic disease (N = 5396).

Disease	N	OR adjusted ^a (95% CI)	P	OR adjusted ^{ab} (95% CI)	P	OR adjusted ^{ac} (95% CI)	P	OR adjusted ^{abc} (95% CI)	P
No known somatic disease	2858	1		1		1		1	
Other somatic diseases	3666	1.727 (1.352-2.205)	<0.001	1.480 (1.142-1.918)	<0.01	1.784 (1.385-2.297)	<0.001	1.537 (1.176-2.009)	<0.001
Only diabetes	57	3.327 (1.410-7.853)	<0.01	2.855 (1.130-7.212)	<0.05	3.479 (1.459-8.295)	<0.01	3.036 (1.204-7.651)	<0.05
Diabetes with co-morbidity	181	1.879 (1.028-3.436)	<0.05	1.267 (.663-2.419)	.474	1.766 (.948-3.388)	.073	1.197 (.617-2.321)	.595

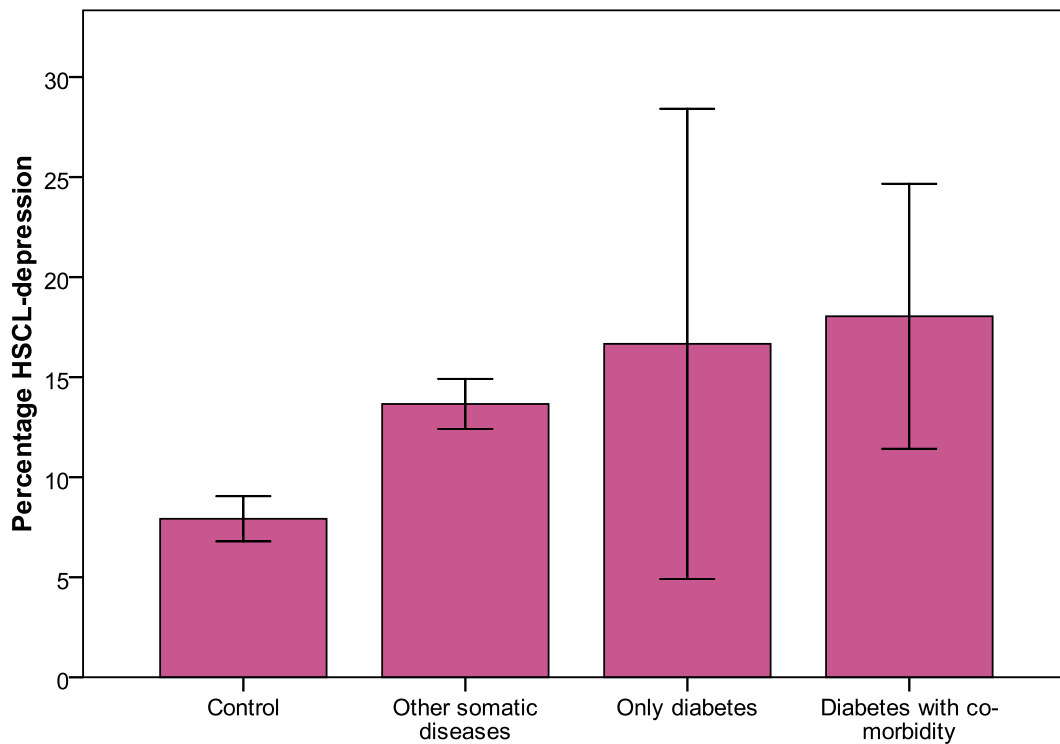
Note₁: Estimates are based on the population responding to both postal questionnaire and interview.

^a OR adjusted for socio-demographic variables and lifestyle

^b OR adjusted for sense of mastery

^c OR adjusted for social support

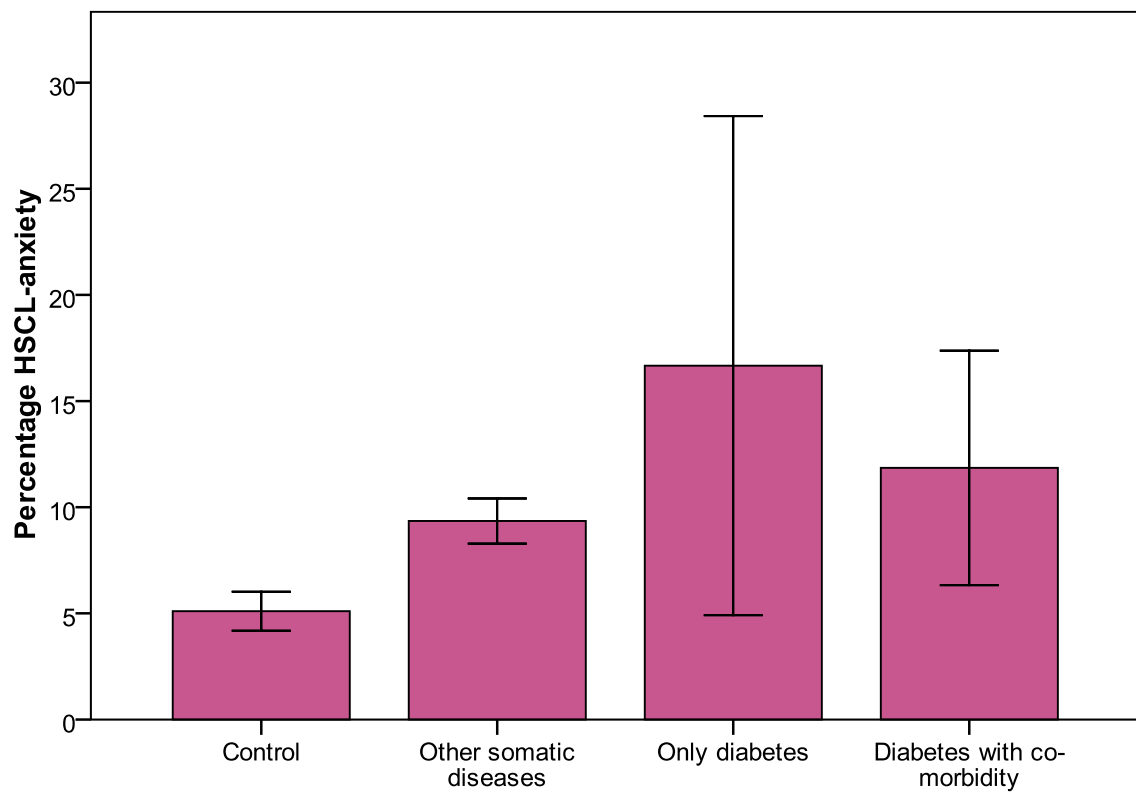
Figure 1 Show percentage of having symptoms of depression in adult individuals having only diabetes, diabetes and co-morbidity, other known somatic diseases and control in Norway 2002 (N =5396).



Note₁: Error bars show 95% confidence interval.

Note₂: Estimates are based on the population responding to both postal questionnaire and interview.

Figure 2 Show percentage of having symptoms of anxiety in adult individuals having only diabetes, diabetes and co-morbidity, other known somatic diseases and control in Norway 2002 (N =5396).



Note₁: Error bars show 95% confidence interval.

Note₂: Estimates are based on the population responding to both postal questionnaire and interview.

REFERENCES

- American Diabetes Association. (2012). Standards of Medical Care in Diabetes. *Diabetes Care*.
- Anderson, R. J., Freedland, K. E., Clouse, R. E. & Lustman, P. J. (2001). The prevalence of comorbid depression in adults with diabetes: a meta-analysis. *Diabetes Care*, 24 (6): 1069-78.
- Bahr, R. (2009). *Aktivitetshåndboken*. Fysisk aktivitet i forebygging og behandling. Oslo: Helsedirektoratet.
- Bisschop, M. I., Kriegsman, D. M., Beekman, A. T. & Deeg, D. J. (2004). Chronic diseases and depression: the modifying role of psychosocial resources. *Soc Sci Med*, 59 (4): 721-33.
- Bjørndal, A. & Hofoss, D. (2004). *Statistikk for helse- og sosialfagene*. Oslo: Gyldendal Norsk Forlag AS.
- Chang-Quan, H., Xue-Mei, Z., Bi-Rong, D., Zhen-Chan, L., Ji-Rong, Y. & Qing-Xiu, L. (2010). Health status and risk for depression among the elderly: a meta-analysis of published literature. *Age Ageing*, 39 (1): 23-30.
- Clarke, D. M. & Currie, K. C. (2009). Depression, anxiety and their relationship with chronic diseases: a review of the epidemiology, risk and treatment evidence. *Med J Aust*, 190 (7 Suppl): S54-60.
- Dalgard, O. S., Dowrick, C., Lehtinen, V., Vazquez-Barquero, J. L., Casey, P., Wilkinson, G., Ayuso-Mateos, J. L., Page, H. & Dunn, G. (2006). Negative life events, social support and gender difference in depression: a multinational community survey with data from the ODIN study. *Soc Psychiatry Psychiatr Epidemiol*, 41 (6): 444-51.
- Dalgard, O. S., Mykletun, A., Rognerud, M., Johansen, R. & Zahl, P. H. (2007). Education, sense of mastery and mental health: results from a nation wide health monitoring study in Norway. *BMC Psychiatry*, 7: 20.
- de Beurs, E., Comijs, H., Twisk, J. W., Sonnenberg, C., Beekman, A. T. & Deeg, D. (2005). Stability and change of emotional functioning in late life: modelling of vulnerability profiles. *J Affect Disord*, 84 (1): 53-62.
- DeSocio, J., Kitzman, H. & Cole, R. (2003). Testing the relationship between self-agency and enactment of health behaviors. *Res Nurs Health*, 26 (1): 20-9.
- Diabetesforbundet. (2011a). *Type 1-diabetes*. Available at: http://www.diabetes.no/no/Om_diabetes/Type_1-diabetes/ (accessed: 10.03.2012).
- Diabetesforbundet. (2011b). *Type 2-diabetes*. Available at: http://www.diabetes.no/no/Om_diabetes/Type_2-diabetes/ (accessed: 10.03.2012).
- Engum, A. (2007). The role of depression and anxiety in onset of diabetes in a large population-based study. *J Psychosom Res*, 62 (1): 31-8.
- Gallant, M. P. (2003). The influence of social support on chronic illness self-management: a review and directions for research. *Health Educ Behav*, 30 (2): 170-95.
- Gavard, J. A., Lustman, P. J. & Clouse, R. E. (1993). Prevalence of depression in adults with diabetes. An epidemiological evaluation. *Diabetes Care*, 16 (8): 1167-78.
- Gili, M., Comas, A., Garcia-Garcia, M., Monzon, S., Antoni, S. B. & Roca, M. (2010). Comorbidity between common mental disorders and chronic somatic diseases in primary care patients. *Gen Hosp Psychiatry*, 32 (3): 240-5.
- Hougen, H. C. & Gløbøden, M. A. (2002). Samordnet levekårsundersøkelse 2002 - tverrsnittundersøkelsen. Dokumentasjonsrapport. Oslo: Statistisk Sentralbyrå.
- Jang, Y., Haley, W. E., Small, B. J. & Mortimer, J. A. (2002). The role of mastery and social resources in the associations between disability and depression in later life. *Gerontologist*, 42 (6): 807-13.

- Jang, Y., Chiriboga, D. A., Lee, J. & Cho, S. (2009). Determinants of a sense of mastery in Korean American elders: a longitudinal assessment. *Aging Ment Health*, 13 (1): 99-105.
- King, M. F. & Bruner, G. C. (2000). Social Desirability Bias: A Neglected Aspect of Validity Testing. *Journal of Psychology & Marketing*, 17 (2): 79-103.
- Korkeila, J., Lehtinen, V., Bijl, R., Dalgard, O. S., Kovess, V., Morgan, A. & Salize, H. J. (2003). Establishing a set of mental health indicators for Europe. *Scand J Public Health*, 31 (6): 451-9.
- Lavikainen, J., Lehtinen, T. F. & Lehtinen, V. (2006). Improving Mental Health Information in Europe. *Proposal of the MINDFUL project*. Finland.
- Moos, R. H., Holahan, C. J. & Beutler, L. E. (2003). Dispositional and contextual perspectives on coping: Introduction to the special issue. *J Clin Psychol*, 59 (12): 1257-9.
- National Institute for Health and Welfare. (n.d.). *Social support*. Available at: http://www.thl.fi/en_US/web/en/search?haku=Social+support&pikahaku=true (accessed: 10.04.2012).
- Nettelbladt, P., Hansson, L., Stefansson, C. G., Borgquist, L. & Nordstrom, G. (1993). Test characteristics of the Hopkins Symptom Check List-25 (HSCL-25) in Sweden, using the Present State Examination (PSE-9) as a caseness criterion. *Soc Psychiatry Psychiatr Epidemiol*, 28 (3): 130-3.
- Penninx, B. W., van Tilburg, T., Boeke, A. J., Deeg, D. J., Kriegsman, D. M. & van Eijk, J. T. (1998). Effects of social support and personal coping resources on depressive symptoms: different for various chronic diseases? *Health Psychol*, 17 (6): 551-8.
- Qiu, S. H., Sun, Z. L., Cai, X., Liu, L. & Yang, B. (2012). Improving patients' adherence to physical activity in diabetes mellitus: a review. *Diabetes Metab J*, 36 (1): 1-5.
- Raphael, K. (1987). Recall Bias: A proposal for Assessment and Control. *Journal of Epidemiology*, 16 (2): 167-170.
- Renn, B. N., Feliciano, L. & Segal, D. L. (2011). The bidirectional relationship of depression and diabetes: a systematic review. *Clin Psychol Rev*, 31 (8): 1239-46.
- Sandanger, I., Moum, T., Ingebrigtsen, G., Dalgard, O. S., Sorensen, T. & Bruusgaard, D. (1998). Concordance between symptom screening and diagnostic procedure: the Hopkins Symptom Checklist-25 and the Composite International Diagnostic Interview I. *Soc Psychiatry Psychiatr Epidemiol*, 33 (7): 345-54.
- Seeman, M. & Seeman, T. E. (1983). Health behavior and personal Autonomy: A longitudinal study of the sense of control in illness. *Journal of Health and Social Behavior*, 24 (2): 144-160.
- Shaban, M. C., Fosbury, J., Kerr, D. & Cavan, D. A. (2006). The prevalence of depression and anxiety in adults with Type 1 diabetes. *Diabet Med*, 23 (12): 1381-4.
- Skaff, M. M., Mullan, J. T., Fisher, L. & Chesla, C. A. (2003). A contextual model of control beliefs, behavior, and health; Latino and European Americans with type 2 diabetes. *Psychology and Health*, 18 (3): 295-312.
- Smit, F., Comijs, H., Schoevers, R., Cuijpers, P., Deeg, D. & Beekman, A. (2007). Target groups for the prevention of late-life anxiety. *Br J Psychiatry*, 190: 428-34.
- Statistisk Sentralbyrå. (2002). Levekårsundersøkinga 1996-1998. *Norges Offisielle statistikk*. C704.
- Strand, B. H., Dalgard, O. S., Tambs, K. & Rognerud, M. (2003). Measuring the mental health status of the Norwegian population: A comparison of the instruments SCL-25, SCL-10, SCL-5 and MHI-5 (SF-36). *Nord J Psychiatry*, 57 (2).

- Stuart, M. J. & Baune, B. T. (2012). Depression and type 2 diabetes: inflammatory mechanisms of a psychoneuroendocrine co-morbidity. *Neurosci Biobehav Rev*, 36 (1): 658-76.
- Thoits, P. A. (1987). Gender and marital status differences in control and distress: Common stress versus unique stress explanations. *Journal of Health and Social Behavior*, 28: 7-22.
- Thomas, J., Jones, G., Scarinci, I. & Brantley, P. (2003). A descriptive and comparative study of the prevalence of depressive and anxiety disorders in low-income adults with type 2 diabetes and other chronic illnesses. *Diabetes Care*, 26 (8): 2311-7.
- van Dam, H. A., van der Horst, F. G., Knoop, L., Ryckman, R. M., Crebolder, H. F. & van den Borne, B. H. (2005). Social support in diabetes: a systematic review of controlled intervention studies. *Patient Educ Couns*, 59 (1): 1-12.
- Whiting, D. R., Guariguata, L., Weil, C. & Shaw, J. (2011). IDF diabetes atlas: global estimates of the prevalence of diabetes for 2011 and 2030. *Diabetes Res Clin Pract*, 94 (3): 311-21.

APPENDIX 1: Key numbers from the Health Survey

Interview survey (total)	Count	Percent (%)
Drawn sample	10 000	
Loss (death, travel abroad/institutionalization)	302	
Gross sample	9 698	100
Apostasy (reservation, disablement, language barriers)	2871	29.6
Nett sample	6827	70.4
Main sample		
Drawn sample	5 000	
Loss (death, travel abroad)	161	
Gross sample	4 839	100
Apostasy (reservation, disablement, language barriers)	1 442	29.8
Nett sample	3 397	70.2
Method: Home visit interview Visit (quota): approximately 43% Average time limit per interview: 33 minutes Period: 1. October 2002 – 21 February 2003		
Supplementary sample		
Drawn sample	5 000	
Loss (death, travel abroad/ institutionalization)	141	
Gross sample	4 859	100
Apostasy (reservation, disablement, language barriers)	1 472	29.8
Nett sample	3 430	70.6
Method: Telephone interview Average time limit per interview: 25 minutes Period: 1. November 2002- 21. February 2003		
Postal questionnaire		
Drawn sample	10 000	
Loss (death, travel abroad/ institutionalization)	325 ¹	
Gross sample	9 675	100
Apostasy (reservation, functional disablement, language barriers)	3 482 ²	36.0
Nett sample	6 193	64.0
Interviewed and answered postal scheme	5 396	55.8
Period: 15. November 2002 – 15 May 2003		

¹ 23 new losses after the interviews were completed

² 511 of the subjects in the gross sample (242 in the main sample and 269 in the supplementary sample) did not receive the scheme, due to language barriers, sickness/ functional disorders or non-response.

APPENDIX 2 – Helping Card

Produktnr. 0202/Spørsmål H3a

KORT 1

<ul style="list-style-type: none"> • Svulster, kreft • Lavt stoffskifte, struma • Sukkersyke, diabetes • Annen hormonsykdom, ernærings- eller stoffskiftesykdom • Blodfattig, anemi • Annen sykdom i blodet eller i de bloddannende organer • Nervøse lidelser • Spiseforstyrrelser • Epilepsi • Multippel sklerose, MS • Svakket syn selv ved bruk av briller • Grønn stær • Grå stær • Døvhets, nedsatt hørsel selv ved bruk av høreapparat 	<ul style="list-style-type: none"> • Migrene, ofte sterk hodepine • Parkinsons sykdom • Annen sykdom i sanseorganene • Annen sykdom i hjernen eller i nervene i kroppen • Høyt blodtrykk • Åreknuter • Annen hjertesykdom • Hjerteinfarkt • Hjerneslag • Dårlig blodomløp i armer eller ben • Kronisk bihulebetennelse • Kronisk bronkitt • Emfysem • Lungebetennelse • Astma • Høysnue/pollenallergi • Annen sykdom i åndedretsorganene 	<ul style="list-style-type: none"> • Magesår • Brokk • Sykdom i lever og galleblære eller galleveier, gallesten • Annen sykdom i fordøyelsesorganene • Sykdom i prostata (hos menn) • Nyresten • Urinlekkasje, inkontinens, vansker med å holde på vannet • Annen sykdom i urin- eller kjønnsorganene • Eksem • Allergiske hudsykdommer • Psoriasis • Annen sykdom i hud eller underhud 	<ul style="list-style-type: none"> • Revmatisme • Leddgikt • Slitasjegikt • Isjias • Nakkesleng, whiplash • Muskelsmerter, fibromyalgi • Hevelse eller smerter i ledd • Bekkenløsning • Lammelser, muskelsvinn som ikke skyldes hjerneslag • Benskjørhet, osteoporose • Annen sykdom i skjelett, muskelsystemet eller bindevevet • Medfødte misdannelser • Lårhalsbrudd • Følger etter andre ulykkestilfelle, skader
---	---	---	--

Vedlegg 5. Hjelpekort

APPENDIX 3 – HSCL 25

12. Nedenfor finner du en oppstilling av plager og problemer som man av og til har. Angi hvor mye hvert enkelt problem har plaget deg eller vært til besvær i løpet av *de siste 14 dagene*.

Sett ett kryss på hver linje.

	Ikke plaget	Litt plaget	Ganske mye plaget	Veldig mye plaget
Hodepine?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Skjelving?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Matthet eller svimmelhet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nervøsitet, indre uro?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plutselig frykt uten grunn?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Stadig redd eller engstelig?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hjertebank, hjerteslag som løper avgårde?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av å være anspent, oppjaget?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anfall av angst eller panikk?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Så rastløs at det er vanskelig å sitte stille?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mangel på energi, alt går langsommere enn vanlig?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lett for å klandre deg selv?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lett for å gråte?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tanker om å ta ditt liv?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dårlig matlyst?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Søvnproblemer?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av håpløshet med tanke på fremtiden?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nedtrykt, tungsindig?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av ensomhet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tap av seksuell lyst og interesse?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av å være lur i en felle eller fanget?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mye bekymret eller urolig?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Uten interesse for noe?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av at alt er et slit?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Følelse av å være unyttig?.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX 4 – Sense of mastery (5-items)

13. Under er det satt opp fem utsagn som dreier seg om erfaringer med å kontrollere og mestre ting i livet. Vi ber deg ta stilling til i hvilken grad du er enig i at disse utsagnene passer for deg. Sett ett kryss på hver linje.

	Svært enig	Enig	Like mye enig som uenig	Uenig	Svært uenig
Jeg har liten kontroll over det som hender med meg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Noen av mine problemer er det ikke mulig for meg å løse.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Det er ikke mye jeg kan gjøre for å forandre på viktige ting i livet mitt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Jeg føler ofte at jeg er hjelpeløs når det gjelder å takle livets problemer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Av og til føler jeg meg som en brikke i livets spill	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX 5 – Informal letter

Vedlegg 1. Informasjonsbrev til respondentene

«IO_NR»
«NAVN»
«ADRESSE»
«POSTNR» «POSTSTED»

Saksbehandler: Hanne Cecilie Hougen
Seksjon for intervjuundersøkelser

Levekårsundersøkelsen 2002

I løpet av de nærmeste ukene vil en intervjuer fra Statistisk sentralbyrå kontakte deg for å avtale et intervju i forbindelse med vår årlige undersøkelse om levekår i Norge. Du er en av 5 000 som er trukket ut til å delta i undersøkelsen. Årets undersøkelse dreier seg hovedsakelig om helse. Undersøkelsen er finansiert av Statistisk sentralbyrå, Nasjonalt folkehelseinstitutt og Norges blindeforbund. Det er frivillig å delta, og du kan når som helst trekke deg fra undersøkelsen, men for at vi skal få gode resultater er det viktig at dere som er trukket ut blir med. **Vi kan ikke erstatte deg med en annen.**

Undersøkelsen er godkjent av Datatilsynet og personopplysninger vil bli behandlet etter lovbestemte regler. **Intervjuerne og alle andre som arbeider i Statistisk sentralbyrå har taushetsplikt.** Vi vil aldri offentliggjøre eller videreformidle opplysninger der enkeltpersoner kan identifiseres. Intervjueren som tar kontakt med deg kan fortelle deg hvordan du får bekreftet at han/hun arbeider for Statistisk sentralbyrå.

For å gjøre intervjuet kortere og for å øke utbyttet av svarene vi får, vil vi også hente inn opplysninger fra Statistisk sentralbyrås registerbaserte utdanningsstatistikk, skatte- og inntektsstatistikk, samt registre i Arbeidsdirektoratet, Rikstrygdeverket og Det sentrale folkeregisteret. Registerne inneholder bl.a. opplysninger om utdanning, inntekt, formue, trygder, stønader og arbeidsforhold. Senest ett år etter at datainnsamlingen er avsluttet vil vi fjerne alle navn og adresser fra datamaterialet. Fødselsnummeret vil samtidig bli erstattet med et kodenummer, som gjør det mulig i ettertid å se svarene i sammenheng med opplysninger i registrene. Våre oppdragsgivere vil kun få utlevert anonymiserte data.

Dersom du har spørsmål om undersøkelsen, kan du ringe grønt nr. 800 83 028, eller sende en e-post til hanne.cecilie.hougen@ssb.no.

Vi håper du vil svare!

Med vennlig hilsen



Svein Longva
adm. direktør



Ole Sandvik
seksjonssjef