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Beyond diagnoses: The importance of social circumstances and lifestyle factors in explaining health-related quality of life and subjective well-being

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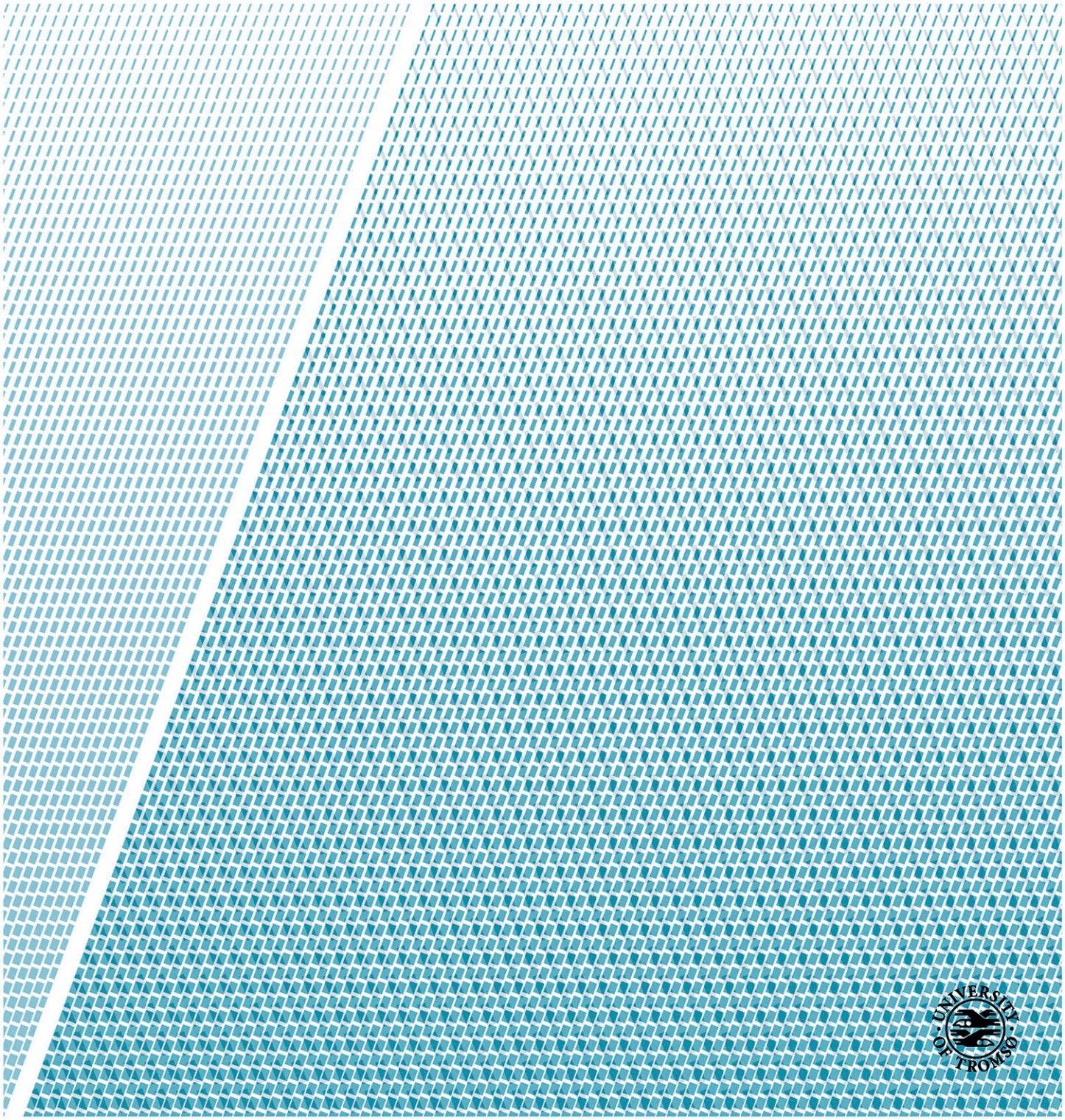

Preface

Handing in this thesis marks the end of eight years of studying. The life has changed in many ways during my studies, but the largest changes I guess has happened inside. I have discovered a lot of new knowledge, new theories, and new ways of thinking. I have met a lot of people that has been taking part in my life, for short and longer periods. Ending this chapter of life is consisting of a range of emotions. It gives me a feeling of sadness, but it also marks an end of having constant bad conscience of not studying enough. It is the beginning of a life with no classes and no exams, but the life will still be full of things to learn and things to discover.

The last two years has been spent with classmates and teachers at the department of community medicine. I have learned a lot. Social theories, health economics, ethics, global health, and of course; Statistics! Thanks to all teachers having patient with our class, we have not always been the easiest students to teach.

My master thesis have been a chapter for it self. Or, I guess it is the life around that has been the problem. Writing a thesis when having a baby at home, a commuting husband and on top of that moving and starting to work full-time, has not been very easy. Thanks to my two supervisors, Jan and Admassu for standing out with my non-frequent communication form – but always giving me advices and leading me in the right direction. I am very pleased with the opportunity of writing a thesis in the field of health economics, and to be able to use the material from the MIC-study.

I have to mention the five girls sharing the last two years in class with. Kjersti, Ingvild and Eirin for being part of our discussion groups, and Naja and Ann Kristin for the subjects you have been taking together with us. The days have been filled with laughing and frustration. Now, those days are over, we are heading in different directions. The days are worth remembering.

Thanks to my lovely husband and adorable kids, thanks for your love and your indulgence. My youngest started his career as a student at the age of three weeks, having to follow his mum at the university. You have been a patient baby!

Thanks to my sister, my mum and my mother in law for taking time off work to babysit my kids during teaching periods. And thanks to all other friends and family for all support during these years of studying.

Now, life will be filled with other things than studying for a time. But never say never, suddenly I will be back as a student…

Forfjord, summer 2015

KEYWORDS AND ABBREVIATIONS:

HRQoL: Health Related Quality of Life

SWB: Subjective Well Being

SWLS: Satisfaction With Life Scale

EQ-5D: EuroQol 5 Dimensions

SF6D: Short Form 6 Dimensions

VAS: Visual Analouge Scale

PA: Physical Activity

WHO: World Health Organization

MIC: Multi Instrument Comparison

CONTENTS

1 ABSTRACT

Background: There exist different descriptive system for reporting Health Related Quality of Life (HRQoL) and Subjective Well-being (SWB). Comparisons of results obtained from respondents shows not only diseases or health status that influence the result, but also social circumstance and behavioural factors are important to consider when analysing the results obtained when measuring HRQoL and SWB.

Methods: The thesis is using a data set obtained from the Multi Instrument Comparison-study comparing different values on outcome measurements regarding health related quality of life and subjective well-being. The data set contains almost 8000 respondents from six different countries, divided into eight groups. In seven of the groups, the respondents have different chronic disease condition, and the last group consists of healthy respondents. In this thesis it is done a multivariate linear regression to compare outcome score on EQ-5D, SF6D, VAS and SWLS. It is also done comparisons between the outcomes by the use of a decomposition table explaining the total variance seen by the different regression models.

Result: The linear regression model explains between 34-40 % of the total variance seen on the outcome measurements. Improved standard of living, higher education and marital status improve the outcome scoring. Smoking and obesity affects the outcome score negatively. Improvement is seen in the score when increasing levels of physical activity. Age and gender influence the outcomes in different ways.

Discussion: The analysis shows that social position and health related behaviour have impact on the outcome score, and that it is necessary to include in analysis regarding HRQoL and SWB. In addition, it also shows a gender difference and differences caused by age, so these variables also needs to be included when examining differences in HRQoL and SWB.

Conclusion: It is necessary to adjust for social position and health related behaviour when analysing measurements of HRQoL and SWB. Social position can account for almost 70 % of the variance seen by the regression model for SWLS, and around 30% of the variance in HRQoL.

2 INTRODUCTION

The MIC-study is an international collaboration study investigating health related quality of life (HRQoL) and subjective wellbeing (SWB) among eight groups, seven having different diseases, and one healthy group. The data is collected from respondents in six different countries (Australia, Canada, Germany, Norway, United Kingdom and United States). This gives the study a unique data set that can be used to look at variations between different outcome variables. Much of the variations seen on the different measurement scales are expected to be caused by the diseases, but after adjusting for the diseases, there is still variations in health related quality of life and subjective wellbeing.

As the title of this thesis is proposing, the variation in health releated quality of life has to be explained by other conditions, such as different social conditions as education and standard of living, or by variation in behavioural factors. It is also crucial to adjust for gender and age, since both are factors influencing the result.

Earlier research shows large variations in the scoring on HRQoL and SWB, as it is not only health condition that has impact on the results. Also the social gradient and health related behaviours influence the scoring on variables measuring HRQoL and SWB.

The aim of this thesis is to investigate the extents to which variations in social circumstances and health related behaviour explain variations in HRQoL and SWB after controlling for gender and age.

3 ANALYTICAL FRAMEWORK

The following section will establish an analytical framework for the thesis. This section will be examining different outcome measures explaining Health Related Quality of Life (HRQoL) and Subjective Well Being (SWB), and will also explain more specific measures included in the analysis of HRQoL and SWB.

3.1 Instruments measuring outcome

The outcomes used to measure how health and wellbeing are experienced can be measured with different sets of instruments. These instruments are basically questionnaires used to perform comparisons on a given set of criteria. There is a wide range of instruments for reporting HRQoL and SWB, but this section will be limited to relevant instruments for this thesis included in the MIC-study.

3.1.1 Health Related Quality of Life

Health related quality of life has evolved as a concept from the 1980s. During the century it became a need for more terms to be able to measure health beside mortality and morbidity(1). HRQoL includes more factors influencing on the perception of health, including social circumstances and behavioural factors. Different systems have been developed during the last decades, and some of them are included and mentioned in the following analysis in this thesis.

3.1.1.1 EQ-5D

The EuroQol-5Dimensions (EQ-5D) was created to be a standardised non-disease specific instrument to describe and value different health states(2). The system was created by the EuroQol Group, and is used as a self-report questionnaire. The system covers five health dimensions; mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. The

EQ-5D has been changed and improved several times through the years, and an improvement in 2009 expanded the system to cover more health states. The potential health states increased from 243 to 3125(3), by increasing the response levels from three to five levels at each question. The scoring on EQ-5D also have new direct valuation tariff, and the tariff used here is in the range from 1.0 for the best possible health and – 0.208 for the worst health(4).

The EQ-5D system was developed with the aim of creating a system that was non-disease specific producing values on health related quality of life in a standardized way(5). The system was meant to be a complement to other systems, and to make it easier to collect data, and make it possible to perform cross-national comparisons.

3.1.1.2 SF 6D

SF 6D ("Short Form 6 Dimensions") is another reporting system for describing HRQoL, and is derived from the larger SF-36(6). SF 6D includes only six dimensions compared to SF36, which includes more. The system was launched as a pilot in 1998, but was later changed. It now consists of some parts derived from SF-36 and some from SF-12. The system describes 18 000 potential health states. Each dimensions included have between four and six different response levels. The scoring on SF 6D variable is 1.0 for the theoretical best possible health, and 0.203 for the worst possible health(3).

3.1.1.3 VAS

Visual analogue scale (VAS) is a scale from 0 to 100 where the respondent should rate their own health(2). The respondent is introduced to a vertical axis where the top (=100) is describing the best state and the bottom (=0) is the worst state. It exists different ways of denoting the scale. One way can be to include VAS as a part of the EQ-VAS questionnaire.

The top of the axis in EQ-VAS describes the best imaginable health state, and the bottom describes the worst imaginable health state.

The MIC project is using another way of denoting the scale, where the top of the VAS scale describes excellent health and the bottom describes death(7). The VAS scale is a very subjective measurement of health compared to EQ-5D and SF 6D that are descriptive systems.

3.1.2 Subjective Well-being

Subjective wellbeing (SWB) is a category of measurement for valuing the good life, or happiness, using more subjective measurements(8). It can consist of questions regarding different aspects of life, such as happiness, job satisfaction, health e.g., or life overall. It exist several different types, but here only one measurement-scale is included; SWLS.

3.1.2.1 SWLS

Satisfaction With Life Scale (SWLS) is constructed to measure how the respondents rates their overall satisfaction with life(9). The scale consists of five items that can be rated from 1 to 7, where 1 is “strongly disagree” and 7 is “strongly agree”. The SWLS system leaves the respondents free to value different components in their life as they want in order to rate their overall life satisfaction(9).

3.2 Independent variables

Independent variables are information given by the respondent about different social position conditions, health related behaviour and basic information as gender and age. This

information is gathered to make comparisons possible and to explain different variations among the respondents.

3.2.1 Social position variables

The social position variables are variables explaining the respondents' social position given their social circumstances. It is shown in several studies that health, and how health is reported, is associated with different social and economical factors, and it exist a social gradient in health(10). The social position variables included in this thesis are education, standard of living and marital status.

3.2.1.1 Education

Education is one part of the group representing socio-economic status. Earlier studies have shown education to be one variable explaining part of the variance from socio-economic status seen in health(11).

3.2.1.2 Standard of living

Standard of living is also a variable taking part of socio-economic status. It is often measured by income, but in this thesis it is used as a self-rated measure of living standard, ranging from very poor to very good.

3.2.1.3 Marital status

Marital status has been shown to have impact on health(12). Marital status has traditionally described unmarried versus married people, but in the last decades other forms of relationships, like cohabitation and same-sex relationships has supplemented the definition of marriage. As a consequence, there has been a growing need to to examine the differences

related to other relation types and the stability of the relationship. In some studies cohabitation and marriage is found to be more similar than the other types of permanent relationships regarding outcomes as social happiness, well-being, global health and relation quality(13).

3.2.2 Health related behaviour

The variables describing health related behaviour is covering information given about daily life and normal habits from the respondents. These variables are normally easier to intervention against, leading to behavioural changes, compared to social position variables.

3.2.2.1 Smoking

Smoking is known to have impact on health, and it is a know risk factor for some communicable diseases. It has been claimed that if there is not taken more serious actions to reduce the amount of smoking world wide, the health consequences of smoking will account for 10 % of all deaths globally in 2030(14).

3.2.2.2 Drinking

Alcohol consumption has a direct impact on health and will through social consequences affect health status(15). The direct effect on health depends both on the amount and the consumption pattern. Consumption can be divided into different categories, and it is normal to distinguish between heavy drinking and a heavily drinking pattern compared to a more occasionally drinking pattern(14).

3.2.2.3 Body mass index

Body mass index (BMI) is considered to be a risk factor for morbidity and mortality. In a global status report on non-communicable diseases, World Health Organization (WHO) states:

"To achieve optimal health, the median BMI for adult populations should be in the range of 21 to 23 kg/m2, while the goal for individuals should be to maintain a BMI in the range 18.5 to 24.9 kg/m2. There is increased risk of co-morbidities for BMIs in the range of 25.0 to 29.9 kg/m2, and moderate to severe risk of co-morbidities for a BMI greater than 30 kg/m2"(14)

Increased BMI has been shown to can result in reduced HRQoL(16), but some studies conclude that the reduction only happens on physical dimensions of the scales, not on the mental dimensions(17).

3.2.2.4 Physical activity duration and frequency

3.2.3 Gender and age

From several studies the results seem to indicate that women have lower HRQoL scores than men(18, 19). It is most common to use gender as a factor to control for, and not as a independent variable of interest, so the data on how gender affects the HRQoL score is not clear(20).

Earlier findings demonstrate that HRQoL and SWB are changing with age. HRQoL decreases with age(19), while SWB has a more u-shaped curve (21). As a consequence it will be necessary to adjust for age when doing analysis regarding HRQoL and SWB.

4 MATERIAL AND METHOD

4.1 MIC-study

The data used in this thesis is obtained from the Multi Instrument Comparison (MIC) study where the aim is to compare different available health and wellbeing instruments. The main aim for the MIC project is to examine why there are large differences between the systems, and why the systems produce different values for one single individual(3). The study is an online survey conducted by a global panel company, CINT Australis Pty Ltd(4, 7), and includes respondents from six different countries. The respondents are divided into eight different response categories according to their health status, one healthy group and seven chronic disease groups. The chronic diseases represented in the study are arthritis, asthma, cancer, depression, diabetes, hearing loss and heart diseases.

The survey company invited respondents to participate, and the participants got a introduction letter from the Monash University, Australia, where the participants was given information about the survey and asked to give a consent for the use of data material afterwards(3).

4.1.1 Questionnaire

The subjective wellbeing questions where asked first and afterwards the participants where asked questions about disease condition, dividing them into the eight different response groups. The respondents were also asked how they rate their overall health on a visual analogue scale ranging from 0 to 100. In the disease groups the participants had to confirm the correct disease with another question like the first, before they where presented for the main questionnaire. After the main questionnaire it followed a disease specific questionnaire according to disease group. The healthy group confirmed their healthy status by answering in a visual analogue scale from 0 (death) to 100 (best possible health), and those reporting a

score under 70 where not invited to continue the survey. If a respondent scored over 70, he or she was presented for the main questionnaire. The VAS scoring on 70 is set to include variation in health, but not including those rating their self perceived health as poor(7). Different quotas was applied to get a representative sample in the healthy-group, and in addition other quotas where used to obtain sufficient respondents in the different groups with chronic diseases(4).

4.1.2 Participants

The participants' were recruited from six different countries, and from seven different chronic disease groups and one healthy group. The total numbers of respondents was 7933 after the exclusion criteria were applied. The table shows the respondents divided into the different disease groups and country.

Table 1; Respondents by country and disease group:

	Country						
	Australia	**Canada**	**Germany**	**Norway**	**UK**	**USA**	**Total**
Healthy group	265	328	260	288	298	321	**1760**
Disease groups							
Arthritis	163	139	159	130	159	179	**929**
Asthma	141	138	147	130	150	150	**856**
Cancer	154	138	115	80	137	148	**775**
Depression	146	145	160	140	158	168	**917**
Diabetes	168	144	140	143	161	168	**924**
Hearing problems	155	144	136	115	126	156	**832**
Heart diseases	149	154	152	151	167	170	**943**
Sub total	*1076*	*1002*	*1009*	*889*	*1058*	*1139*	***6173***
Total	**1341**	**1330**	**1269**	**1177**	**1356**	**1460**	**7933**

4.1.3 Exclusion from the study

Section 4.1.1 is describing how the disease groups had to confirm their disease, and the healthy group had to have a score over 70 on the visual analogue scale to be further included in the study. Other exclusion criteria were applied after completion of the survey. It was included a set of similar and duplicated questions in the questionnaire, and answers differing was inspected, and removed from the study if the discrepancy was too great. The study also set a criteria on minimum 20 minutes for completion time of the questionnaire, excluding respondents where if completion time was below(7).

4.2 Analysis of data

The majority of statistical analysis is conducted with IBM SPSS version 22. The decomposition table is made by STATA. The variables included are being described in section 3.1 and 3.2 giving an overall view of the variables with references to literature and earlier studies. The section below is describing the variables more detailed, regarding levels included and which levels chosen to be used as reference category.

4.2.1 Outcome variables

The main outcomes of this study are divided into four different measurements that report health related quality of life (HRQoL) or subjective wellbeing (SWB). The measurements for HRQoL are three different systems, where EQ-5D and SF6D are descriptive systems based on more objective criteria, and VAS is an overall rating over satisfaction with the respondent's own health, this has been described more detailed in section 3.1. SWB is represented with a "satisfaction with life-scale" (SWLS), which is a more subjective describing of the respondents own satisfaction with life. It is shown earlier that the combined score of the three first questions give a better description of overall satisfaction with life than the combined

score for all five variables(22). In this thesis, the SWLS variable is therefore based on the first three of the five questions the scale normally consists of.

All outcome variables have a linear scaling over different scales respectively to the different variables.

4.2.2 Independent variables/Covariates

The independent variables are divided into different subgroups according to the type of variable and the possible interaction with the dependent variables. The subgroups are social position, behavioural variables and a group including gender and age. In addition, the analysis is adjusted for different disease groups and different country.

4.2.2.1 Social position variables

The social position variables are variables explaining the social position of the respondents. Education, standard of living and marital status are the three different social position variables included in this thesis.

Education is a three group variable comparing the differences between persons having finished high school and those with diploma or university education.

Standard of living was initially rated in a four-items scale in the MIC-study, but since the two lowest groups consist of very few people, they are collapsed into one group representing "poor" standard of living. The standard of living group "poor" is compared to "good" and "very good" in the linear regression model, to look for significant differences in how they rate their health and wellbeing. The sizes of the different groups are remarkable different in numbers, where the "good"-group counts for more than half of the respondents.

Marital status is not describing the married or unmarried, but it is describing weather or not the respondents are living with another person, since cohabitation show equal affect on health as marriage, described more detailed under section 3.2.1.3.

4.2.2.2 Behavioural variables

Behavioural variables are variables explaining how people behave and the choices they make for their own way of living. Four different types of variables are included here, one of them are divided into two separate categories, giving five variables describing the health related behaviours of the respondents.

Smoking is included as a dichotomous variable defining if the respondent is a smoker or a non-smoker. The dataset gives information about the amount of smoking on a normal day, from the range "non-smoker" to "more than 21 cigarettes each day". Smoking is known to have impact on health, and research does not always differentiate the amount of smoking. In this thesis all smokers will be collapsed into one group, since the aim is to look how smokers rates their health compared to non-smokers. The group of non-smokers is much larger than the group of smokers.

Drinking intensity is transformed from a five-items variable to a variable with two levels, describing the amount of drinking. The variable is trying to differentiate between a heavy and a more occasional drinking pattern. The levels were dividing the respondents between those drinking four units or less, and those drinking five or more units when drinking. This variable has a large portion that did not respond to this question in the questionnaire. The non-respondents where compared with the answer given on a question regarding drinking frequency. This comparison revealed that the non-respondents correspond to the people categorizing them as non-drinkers on the question about drinking frequency. The non-

respondents are therefore included as a separate group to compare non-drinkers to those drinking four units or less, and five units or more, to see if there are any differences between the groups. As a result, the variable now consists of three levels. The non-drinkers are used as reference group in the regression model.

The BMI-variable is constructed from self-reported height and weight given by the respondents. It is here used as a categorical variable with three categories defined from the World Health Organization´s (WHO) definition of normal weight, overweight and obesity(14). The respondents categorized as underweight consist of a very small group, and they are included in the group of the normal weighted. The group consisting of the once with normal weight is used as reference when conducting the regression.

Physical activity frequency describes how often the participants do moderate to intense physical activity. The variable has five levels, ranging from “never” to “almost every day”. The reference category for the regression model is the lowest group, those reporting that they never exercise.

Physical activity duration is describing the duration of physical activity when training. The questions had four different levels, dividing into groups of less than 15 minutes, less than half an hour, less than an hour and more than an hour. There was a large portion of non-responders on this question. When running comparisons with the frequency question described earlier, these where the same respondents answering “never” on the question above. The non-respondents are included in the analysis as a separate group named “do not exercise”. This group is also chosen to be the reference category.

4.2.2.3 Gender and age

The gender differences in the rating of HRQoL and SWB are being included in the analysis since literature describes gender differences in rating of the outcome variables(18, 19).

Age is given in the original questionnaire as numbers, but here the numbers are collapsed into five different groups. The three middle groups have age-spans of ten years, but the lowest and the oldest groups have larger spans since they are covering the rest of the respondents. The youngest group is used as reference category in the regression model.

4.2.3 Control variables

These variables are used for adjustment of the result since the dataset not is based on a representative selection from a population, but includes respondents having different diseases, and representing different countries. These variables are not being reported in the tables, but are being adjusted for in the analysis.

4.2.3.1 Disease

The disease variable is used as an adjusting variable. The respondents are divided into eight different groups based on underlying disease, as described earlier. The largest group consist of the healthy persons, the others groups are smaller and containing respondents with different conditions: asthma, cancer, depression, diabetes, hearing problems, arthritis and heart-conditions. It is necessary to adjust for disease, since a large portion of the respondents has a chronic disease.

4.2.3.2 Country

The country variable is used as an adjusting variable since the dataset contains respondents from six different countries. These countries are represented with different respondent numbers. The countries represented are Australia, Canada, Germany, Norway, UK and USA.

4.3 Statistical methods

This section describes the methods used to get an overview of the distribution of data analysed with descriptive statistical methods, and the association between the outcome variables and the different independent variables adjusted for control variables.

4.3.1 Descriptive statistics

To make comparisons of the different groups inside the different variables, the variables are examined separately. To check for significant differences between the different groups, it is used non-parametric tests. Mann-Whitney U-test is used where the independent variables are dichotomous, and Kruskal-Wallis test is used where the variables have more than two groups. The Kruskal-Wallis test gives an overall result about significant differences between groups, but to know which groups there is differences between it is afterwards done a pairwise comparison between the different groups and using an adjusted p-value to check for significant differences.

4.3.2 Linear regression

The outcome measurements are continuous variables and therefore linear regression is used to examine how the independent variables affect the different outcomes. Linear regression makes it possible to include different independent variables, and control variables in the model. More specific it is used a multivariate linear regression model, to be able to include all four outcomes in the same model, and not having to do four different models.

4.3.2.1 Building a regression model

The model is build by including all variables to look at their influence at the outcome, and excluding variables with no significant impact. The variables included is defined from earlier research and known theory about impact on HRQoL and SWB, these are described in section 3 about the analytical framework of this thesis.

4.3.2.2 Multicollinearity

The variables where combined to examine and control for multicollinearity. The analysis in this thesis encountered a problem with the variables describing physical activity, because the variance inflation factor (VIF) where above the level of acceptance. To be able to include both the variable describing duration of physical activity, and the variable describing frequency in the analysis, the multivariate regression had to be run in two separately models. One model includes the frequency of physical activity together with all other variables of interest, and the other model exchange the frequency with duration of physical activity.

5 RESULT

5.1 Descriptive statistics

5.1.1 Outcome variables

The different outcome measures are three variables from HRQoL; EQ-5D, SF 6D and VAS, and one variable regarding SWB; SWLS. Table 2 present the total numbers for the outcome variables.

Table 2; Outcome variables:

	N	Mean	Median	Std. deviation
EQ-5D	7933	0.8219	0.8690	0.19055
SF 6D	7932	0.7115	0.7000	0.13720
VAS	7760	0.6735	0.7500	0.21542
SWLS	7919	0.6362	0.7143	0.22115

5.1.2 Independent variables

The different independent variables are examined separately and they are tested with Mann-Whitney U-test and Kruskal-Wallis test to check for significant differences between different groups inside each variable. The table gives a view of the mean values for the different groups inside each independent variable for all the outcome variables. The data presented in the table is based on the crude non-adjusted data from the MIC-study. The result cannot be interpreted as the true result, but it can give a hint about the trend for the variable.

Table 3; Independent variables:

		Distribution	EQ-5D	SF 6D	VAS	SWLS
Education	University	28.3	0.8462	0.7272	0.7014	0.6672
	Diploma	40.4	0.8194	0.7087	0.6673	0.6373
	High school	31.3	0.8031	0.7009	0. 6564	0.6067
Standard of living	Very good	29.5	0.9005	0.7787	0.7738	0.7850
	Good	58.0	0.8212	0.7046	0.6671	0.6203
	Poor	12.5	0.6394	0.5846	0.4732	0.3574
Living with a partner	Yes	64.1	0.8336	0.7220	0.6901	0.6714
	No	35.9	0.8010	0.6927	0.6438	0.5734
Smoking	No	75.8	0.8345	0.7207	0.6826	0.6539
	Yes	24.2	0.7825	0.6826	0.6294	0.5807
Drinking intensity	Non-drinker	25.0	0.7737	0.6822	0.6321	0.6086
	4 or less	65.8	0.8388	0.7233	0.6907	0.6531
	5 or more	9.2	0.8324	0.7060	0.6627	0.5901
BMI	<25	32.7	0.8589	0.7343	0.7188	0.6554
	25-30	34.1	0.8390	0.7250	0.6921	0.6572
	30 <	33.2	0.7784	0.6818	0.6185	0.6016
Physical activity frequency	Never	18.7	0.6909	0.6294	0.5479	0.5431
	< Once a week	19.0	0.8073	0.6874	0.6385	0.6053
	Once a week	11.7	0.8441	0.7118	0.6860	0.6464
	2-3 times/week	31.1	0.8682	0.7441	0.7268	0.6790
	About everyday	19.5	0.8749	0.7616	0.7365	0.6813
Physical activity duration	Do not exercise	18.7	0.6910	0.6295	0.5480	0.5434
	< 15 min	15.3	0.7946	0.6845	0.6385	0.6092
	15 – 29 min	22.4	0.8444	0.7211	0.6896	0.6225
	30 – 60 min	31.2	0.8741	0.7467	0.7314	0.6756
	60 min +	12.3	0.8820	0.7632	0.7335	0.6814
Gender	Male	47.8	0.8349	0.7276	0.6720	0.6421
	Female	52.2	0.8100	0.6967	0.6748	0.6308
Age group	18-34	18.4	0.8614	0.7113	0.7078	0.6337
	35-44	14.3	0.8187	0.7008	0.6687	0.6046
	45-54	21.1	0.7886	0.6934	0.6424	0.5942
	55-64	24.9	0.7974	0.7056	0.6480	0.6308
	65 +	21.4	0.8516	0.7434	0.7083	0.7072

5.1.2.1 Social position variables

The education variable is dividing the respondents into three categories, depending on education completed. When testing with Kruskal-Wallis test it shows significant difference between the groups for all outcomes.

The respondents categorizing their current standard of living as poor, has a much lower score on both HRQoL and SWB than the other two groups. The respondents in the "very good"-group had the best scores on all variables. When testing with Kruskal-Wallis test it shows significant difference between the groups, and group comparisons shows significant differences between all groups for all outcome variables.

The respondents living with a partner scores higher on all outcome variables, and testing with Mann-Whitney U-test confirms significant differences between those living with a partner compared to those not living with a partner.

5.1.2.2 Behavioural variables

Non-smokers have higher results on the outcome variables than the smokers do. Testing with Mann-Whitney U-test confirms that all outcome variables have significantly differences between smokers and non-smokers.

The variable describing drinking has three levels, the non-drinkers, those drinking less than four units when drinking and those drinking more than four units when drinking. The group containing "4 units or less" has the highest score on all variables, and the non-drinkers scores lowest on three out of the four outcome variables (not on SWLS). When testing with Kruskal-Wallis test, there is a significant difference between some of the groups inside all outcomes variable, but not between all groups.

Body mass index has three levels differentiating between normal weighted (including those that are underweighted), overweight and obese people. The group with highest BMI scores lowest on all outcome variables. Testing with Kruskal-Wallis test, it shows significant differences between the groups. Pairwise comparisons show no significant differences between normal weight and overweight for SF 6D and SWLS, but all other group comparisons are significant.

For all variables the mean score increases with increased frequency of physical activity. The Kruskal-Wallis test shows significant difference between the groups for all variables, but group comparisons shows some non-significant differences between the two highest frequency groups.

The variable comparing different length of physical activity from 0 to more than 60 minutes shows an increased score with increased duration of physical activity. The Kruskal-Wallis test shows significant difference between the groups for all variables.

5.1.2.3 Gender and age

At the gender variable, males have higher mean scores on three out of four variables, but on VAS the females have higher score though the difference is very small. Testing with Mann-Whitney U-test shows significant differences across gender only for EQ-5D and SF 6D.

The five different age groups of the respondents are of comparable sizes. When testing with Kruskal-Wallis test, it shows significant differences between some of the groups inside each of the four outcome variables, but not all group comparisons inside each variable are significant.

5.2 Linear regression

5.2.1 Model fit

There are differences between the outcome variables in how well the model fit. When looking at the adjusted R-square for the different outcomes, it shows that the models explain between 34.2% (EQ-5D) and 40.3% (SWLS) of the variance presented. The table below present the different adjusted R^2 for the regression models including either physical activity frequency or physical activity duration.

Table 4; Adjusted R^2-score for both models:

	Model with PA frequency	Model with PA duration
EQ-5D	34.2	34.5
SF6D	35.8	35.7
VAS	37.3	37.2
SWLS	40.3	40.2

5.2.2 Regression

The regression is conducted by the use of two separate models, where the difference is how physical activity is included in the model. The first model shows physical activity represented by frequency, and the second model includes physical activity duration. All other variables are identical in the two models. The first model is presented in table 5, and the second model is available in the appendix. The tables present the constants, and the difference in outcome score for each independent variable. The standard error is presented in parentheses below. Where the result is significant different from the reference, it is marked by an asterisk.

Table 5; Regression included frequency of physical activity:

		EQ-5D	SF 6D	VAS	SWLS
Education (ref "high school")	Diploma	0.003	- 0.002	0.002	0.013*
		(0.00429)	(0.00308)	(0.00475)	(0.00480)
	University	0.006	0.003	0.011*	0.024*
		(0.00472)	(0.00339)	(0.00523)	(0.00528)
Standard of living (ref "poor")	Very good	0.169*	0.129*	0.199*	0.353*
		(0.00663)	(0.00476)	(0.00734)	(0.00742)
	Good	0.120*	0.078*	0.129*	0.213*
		(0.00579)	(0.00416)	(0.00642)	(0.00648)
Living with a partner (ref "no")	Yes	0.003	0.005	0.016*	0.048*
		(0.0038)	(0.00273)	(0.00422)	(0.00427)
Smoking (ref "no")	Yes	- 0.015*	-0.009*	- 0.016*	- 0.009
		(0.00445)	(0.00311)	(0.00481)	(0.00486)
Drinking intensity (ref "non-drinker")	4 or less	0.030*	0.014*	0.025*	0.003
		(0.00429)	(0.00308)	(0.00476)	(0.00480)
	5 or more	0.044*	0.016*	0.028*	- 0.011
		(0.00709)	(0.00508)	(0.00785)	(0.00793)
BMI (ref "<25")	25-30	- 0.007	- 0.004	- 0.006	- 0.009
		(0.00445)	(0.00320)	(0.00494)	(0.00499)
	30 <	- 0.029*	- 0.018*	- 0.042*	- 0.006
		(0.00463)	(0.00332)	(0.00513)	(0.00519)
Physical activity frequency (ref "never")	< Once a week	0.083*	0.038*	0.059*	0.028*
		(0.00587)	(0.00421)	(0.00651)	(0.00657)
	Once a week	0.107*	0.053*	0.092*	0.044*
		(0.00678)	(0.00486)	(0.00751)	(0.00759)
	2-3 times a week	0.115*	0.071*	0.109*	0.056*
		(0.00545)	(0.00391)	(0.00604)	(0.00610)
	About everyday	0.117*	0.082*	0.111*	0.051*
		(0.00604)	(0.00433)	(0.00669)	(0.00676)
Gender (ref "male")	Female	- 0.006	- 0.014*	0.015*	0.013*
		(0.00376)	(0.00270)	(0.00416)	(0.00421)
Age group (ref "18-34")	35-44	- 0.021*	0.002	- 0.017*	- 0.021*
		(0.00639)	(0.00458)	(0.00707)	(0.00715)
	45-54	- 0.032*	0.006	- 0.015*	- 0.014*
		(0.00598)	(0.00429)	(0.00662)	(0.00669)
	55-64	- 0.031*	0.013*	- 0.008	0.004
		(0.00600)	(0.00429)	(0.00662)	(0.00669)
	65 +	- 0.010	0.022*	0.016*	0.036*
		(0.00632)	(0.00453)	(0.00700)	(0.00707)
Constant		0.718*	0.649*	0.599*	0.378*
		(0.0107)	(0.00767)	(0.0118)	(0.0120)
Observations		7,521	7,521	7,521	7,521
R-squared		0.345	0.361	0.375	0.405

5.2.3 Social position

For both EQ-5D and SF6D, there is no significant difference in the score between people with different education. When looking at the regression with physical activity represented with frequency, the VAS is higher for education from university compared to education on a high school level. When including duration of physical activity, the difference caused by education is not significant for VAS as outcome score. SWLS has higher scores for both diploma and university education compared to the score for high school education in both regression models.

Standard of living has significant differences in reported score when comparing a poor standard to a good or a very good standard of living. This is applicable for all outcome variables, and a very good standard of living has a higher score than a good standard of living.

Marital status has no significant result for EQ-5D or SF6D, but it has significant results on both VAS and SWLS. Living with a partner has a positive impact for the result on these variables.

5.2.4 Behavioural variables

Respondents smoking scores lower on EQ-5D, SF6D and VAS, compared to non-smokers. There is no significant difference between smokers and non-smokers considering SWLS as outcome score.

The intensity of drinking uses “non-drinkers” as reference, and for EQ-5D, SF6D and VAS there is significant difference in the score compared to the two groups of drinkers, where the score increases with more drinking. The difference in score between “4 or less” and “5 or more” is small. For SWLS, there is no significant difference between the different groups.

When comparing scores for BMI, there is significant difference between those having a BMI lower than 25 and those with a BMI higher than 30, for the outcome EQ-5D, SF6D and VAS. The people in the obese group has a lower score compared to those with a BMI < 25. There is no significant difference for SWLS considering BMI and the different groups. For all outcome variables there is no difference between the normal weighted and those with non-obese overweight (BMI between 25 and 30).

Frequency of physical activity uses "never" as reference, and for all outcomes there are significant higher score in all groups representing more physical activity. The score increases with more physical activity.

Duration of physical activity uses "no exercise" as reference, and there is significant difference between this category and the higher categories for all outcome variables. The outcome score increases with longer duration of physical activity.

5.2.5 Gender and age

There is no significant difference between genders when considering EQ-5D. For SF6D there is a difference giving males a higher score than females. For both VAS and SWLS the females has significant higher score compared to the males.

The lowest age group is used as a reference category. For EQ-5D, there is significant difference compared with the three next groups showing a decreasing score on the outcome, while the difference for the last age group is not significant. SF6D has no significant difference between the reference and the two next groups, but there is difference to the two oldest age groups. On the outcome score for VAS there is only difference between the reference and the oldest age group, showing an increased score for the oldest group. For SWLS there is a significant decrease for the second age group compared to the reference

group, but then it starts a trend for an increased score, though without all result being significant. The group between 45-54 years of age also has a lower score than the reference group, but increased compared to the second group. The group 65+ has the highest score, and this is also significantly different from the reference group, giving SWLS a u-shaped age-curve.

5.3 Decomposition of total variance

To get a more combined overview of the differences regarding the different outcomes, it is presented as a decomposition table. The table describes how the total variance of the different outcomes is divided on the different categories of independent variables. The table differentiate between the share of the total variance of each outcome, and the categories percentage of the R-squared value of each model.

Table 6; Decomposition of total variance:

	EQ-5D		SF6D		VAS		SWLS	
	Share	In %	Share	In %	Share	In %	Share	In %
Social position	0.105	30.0	0.117	32.2	0.118	31.3	0.277	68.4
Behavioural	0.106	30.4	0.086	23.8	0.087	23.2	0.039	9.5
Gender and age	0.013	3.8	0.013	3.7	0.010	2.5	0.017	4.2
Diagnosis	0.117	33.4	0.140	38.5	0.147	39.1	0.061	15.0
Country	0.008	2.4	0.007	1.8	0.015	3.9	0.012	2.9
Total R-square	0.349	100.0	0.363	100.0	0.376	100.0	0.405	100.00

The differences in shares of the different categories the decomposition table consist of, are small comparing EQ-5D, SF6D and VAS to each other. Social position, behavioural factors and diagnosis count together for 94 % of the variance. Diagnosis has the highest share for all these three outcome variables, explaining between 33 and 39 % of the variance. Social position counts for around 30 % of the variance for the three outcomes reporting HRQoL. The remarkable difference is when looking at the numbers in the column representing SWLS. Diagnosis only counts for 15% of the total variance present, whereas social status counts for almost 70 %.

6 DISCUSSION

6.1 Main findings

6.1.1 Descriptive

Much of the descriptive findings were the same findings expected before running the analysis. Improved social position improves the outcome score, and the same does improved health related behaviour. Age is following the expected curve, and there is a gender difference. However, the next paragraphs will make some comments regarding the descriptive statistics, drinking intensity and BMI, since these two variables is revealing some interesting findings.

They heavy drinkers represents 9.2% of the respondents, while the numbers of people suffering of "alcohol use disorders" according to the WHO for the countries included in the MIC-study, lies between 3.7 and 12.4% (23). This might indicate that the proportion included as heavy drinkers in the analysis performed in this thesis, is too high to be fully representative regarding heavy drinkers. The total proportion of heavy drinkers from all six countries included, is somewhere inside the interval reported by WHO. The total numbers representing the heavy drinkers is used in the analysis, even though it might be higher than what it should have been. It is therefore necessary to interpret the result with caution.

For BMI, the distribution of the respondents shows very equal group size between the three groups. This is indicating an un-normal large group of both overweight and obesity. The trend for upper-middle- to high-income countries is between 55 – 60 % of the population having a BMI of more than 25. For the same countries there is a trend for 20 – 25 % of the population to be categorized with obesity(14). This indicates a decreased group of respondents with normal weight in this study compared to what is expected.

6.1.2 Outcomes

In this section the result on the four outcomes will be discussed in different sections. At the end it follows a concluding paragraph trying to sum up the results.

6.1.2.1 EQ-5D

When comparing the variables describing social status included in the regression, education and living with or without a partner, does not influence the outcome score for EQ-5D significantly. There is an increased score for improved standard of living, describing most of the variance in HRQoL seen for the social position variables. The decomposition table indicates that a 30 % share of the total variance seen by the regression variables is caused by social status variables, and around 11 % of the total variance seen in HRQoL.

All of the behavioural variables have significant findings, and their share of the total variance is also around 30 %. Smoking and obesity have negative effect on the outcome score. This is not surprising due to earlier research, since both variables affect at least the physical components of health (14, 16, 17). For physical activity, it shows an increased outcome score when physical activity increases. The increase in score is highest for the two lowest groups, and the slope flattens for the groups exercising more than once a week. Improvement from "once a week" to more often is not regarded to give the respondent better health score on the EQ-5D questionnaire.

For alcohol the difference between the non-drinkers and the drinkers are significant, with a lower outcome score for the abstainers. Abstainers might be less healthy than their drinking neighbours, or at least they categorize themself as it. There is also a non-significant difference between those drinking "4 or less" and the more heavy drinkers. This finding is a bit

surprising since heavy drinking it is known to affect health(15). The finding can be a result of not differentiating enough between heavy drinkers and more regular drinking habits.

There is a significant difference between the group of normal weighted and the obese group regarding BMI. This association is expected and complies with earlier research. One explanation for the middle group with overweight, can be that they have increased weight, but not to a level causing serious health consequences, since they have not reached the level of obesity. Another explanation is the middle group being larger than expected, and the lowest group is smaller than expected. This will diminish the differences between the two groups.

Increased physical activity, both increased duration and frequency, improves the outcome score. This is shown in earlier research, and complies with health related guidelines and advises.

There is no gender influence on EQ-5D variable. Increased age gives a decrease in the outcome score, and flattens for people in middle age (45-54). The oldest group seems to have an increased score, but this finding is not significant. Age and gender has a 4 % share of the total variance seen by the chosen variables, and these variables only explains slightly above 1 % of the total variance seen in HRQoL. This indicates that age and gender only contributes very little to the total scoring on EQ-5D, and the scoring is pretty stable between males and females, and between different age groups.

6.1.2.2 SF 6D

For the SF 6D, the variables describing education and marital status have no significant impact on the outcome score. Most of the variance caused by social position variables is related to standard of living. The social position variables count for 32 % of the variance seen

in the regression. This indicates that standard of living have a high influence on the total score compared to many of the other variables.

For behavioural variables the share of total variance is 24 %. This is divided on all of the different variables included in the category. As for EQ-5D, smoking and obesity has significantly negative effect on the outcome score, whereas the rest of the variables have positive impact. The scoring on the variables differs a little from the results from EQ-5D, but the same explanation for this variation seems to be applicable for SF 6D.

There is a significant difference between the genders, and females have lower score compared to the males. For the age variable there is a trend with increased score for increased age. However, only the two oldest groups are significantly different from the youngest reference group. The increase of the score is small, and only valid for two groups compared to the reference, but this is an improvement for the two oldest age-groups indicating a real increased score with age. The trend for increased score is the opposite of what is expected from earlier research.

6.1.2.3 VAS

For VAS both the variables describing education and marital status have significant result, compared to the earlier described outcomes with no significant result. Having education on a university level will significantly improve the outcome score on the VAS-variable, indicating an improvement in how the respondents rate their own health state. Living with a partner also improves the outcome score significantly, indicating a better health state compared to living alone. A good or a very good living status also have significant improvement on the outcome. In the decomposition table, the social position variables accounts for 31% of the total variance

seen by the regression. All three variables describing social position are influencing this total variance.

For the behavioural variables, the result for the VAS outcomes are very similar to the results described for EQ-5D and SF6D, and there is no sign of other explanations than those given in the section 6.1.2.1 describing the results for EQ-5D.

The gender difference is showing a significantly improved score for the females. For age the scoring indicates to form a U-shaped curve, and a U-shaped curve is expected for variables describing SWB. VAS is based on an objective constructed scale, but still it is a very subjective measure, placing it somewhere between HRQoL and SWB. The result is not surprising, but indicate that VAS might belong under SWB and not HRQoL. The sharing of total variance seen by these variables is small, so the real impact on the outcome score is low.

6.1.2.4 SWLS

Looking at the decomposition table, SWLS differs remarkable from the other three outcome variables. The social position variables count for almost 70 % of the total variance seen by the regression, compared to around 30 % for the other three variables. The increase is followed by a reduction on the impact of behavioural variables and diagnosis, indicating that the outcome score is depending less on these factors. For the social position variables, all three has significant results, and the increased score have higher values when comparing them to the other three outcome variables. The comparison should be done with caution since the scales differ, but it is possible to conclude with higher impact when also including the differences in the decomposition table.

Education has significant improvement in outcome score both for diploma and university education compared to high school, compared to the other outcomes where non or only

university education has significant result. Standard of living has a result as the other outcome variables, both good and very good standard of living is significantly better than poor standard of living. Living with a partner also improves your satisfaction with life significantly.

Behavioural variables have less impact on satisfaction with life, and it only counts for around 10 % of the total variance seen by the regression. The result differs also from the result seen at other outcome variables, and it is only for physical activity it is significant result. Smoking, BMI and drinking has not significant impact on the outcome score.

Also for SWLS females has significant higher score compared to the males. The age curve is showing a significantly u-shape corresponding to the result expected from literature.

6.1.3 Concluding remarks

For the variables describing social position it is only standard of living that has significant result on all outcome measures, and a better standard improves the outcome score. Both increased education and living in a relationship improves subjective wellbeing and VAS, but it has no significant improvement for EQ5D and SF6D. The social position variables explain much of the variation shown by the regression, and they are important to include in a regression model when examining the differences in HRQoL and SWB.

Behavioural variables also have much impact on the regression for HRQoL, but it is less important when considering SWB. As expected smoking and obesity decrease the outcome score for the three HRQoL variables. More physical activity improves the score for all outcomes. A bit surprising is that alcohol has no negative effect when considering a heavily drinking pattern, compared to non-drinkers or a more occasional drinking pattern. As earlier

explained, this can be a result of the level set when differentiating between light and heavily drinking.

For age the result in this thesis is not according to what is expected from earlier research. The EQ-5D is decreasing with age, according to earlier research, but SF6D is showing the opposite result, the score increases with increased age. For both VAS and SWLS it seem like the trend is U-shaped, but it is only for SWLS the increasing result at high age is significant compared to the young reference group.

6.2 Strength and limitations

6.2.1 Strength

The thesis is written based on material collected in a large multinational study, so the data set is large due to a large sample size. The study population is large and consisting of people from different countries from different parts of the industrialized world. It includes both healthy persons and persons having different disease condition, divided into different age groups including both young adults and elderly persons. Since the study population is diverse the result can be implicated on other populations also, but with caution since the study population is not representative for a normal population.

6.2.2 Limitations

As mentioned, the study population is not based on a normal population. The result can therefore not be interpreted directly to be representative for a population in an industrialized country.

The study is also based on self-reporting in an internet based survey. Self-reporting can be biased by the respondents willingness to report truly answers on questions regarding both

social and personal status. Alcohol consumption is well know to have answers biased by self-reporting(24).

Some data are missing in the analysis, and respondents with missing response on some of the variables included in the analysis are excluded from the regression model. The questions with largest non-response rate where questions about alcohol consumption when drinking and duration of physical activity when exercising. This is adjusted for when comparing them with answers on similar questions, revealing a relationship between answers on different questions regarding the same theme. Including those non-reporting duration of physical activity as "never exercise" and missing data on drinking pattern as "non-drinkers" reduce the numbers of missing data. Even when doing this, the total numbers included in the regression analysis, is reduced by around 5 % of the total respondents.

6.3 Implication for further research

This thesis implies that it is necessary to adjust for social position and health related behaviour when doing comparisons between different outcome measurements regarding HRQoL and SWB. Especially when considering SWLS, almost 70 % of the variance explained by the variables included in the regression model, are caused by differences in social position. For EQ-5D, SF6D and VAS this portion is lower, but still around 30% of the variance seen on these variables are explained by social position.

It is also necessary to adjust for health related behaviour, since parts of the variance seen are caused by behavioural factors. Behavioural factors have more impact on HRQoL than it has on SWB, explaining between 30% and 40% of the variance in HRQoL compared to around 10% for SWB for the measurements used in this thesis.

Future studies should be aware of the impact social position and health related behavioural factors has on the outcome score, so they can be able to adjust for these factors when analysing the results.

REFERENCES:

1. Measuring Healthy Days. Atlanta, Georgia: Centers for Disease Control and Prevention, 2000 November 2000. Report No.
2. EuroQol - a new facility for the measurement of health-related quality of life. Health Policy. 1990;16(3):199-208.
3. Richardson J, Iezzi A, Maxwell A. Cross-national comparison of twelve quality of life instruments: MIC Paper 1, Research Paper 76 2012 [cited 2015 April 15]. Available from: http://www.buseco.monash.edu.au/centres/che/pubs/researchpaper76.pdf.
4. Lamu Admassu N, Gamst-Klaussen Thor, Olsen Jan Abel. Does Weighting Matter? - Comparing Weighted vs. Unweighted Values in two Health State Utility Instrument; EQ-5D-5L and 15D.
5. Brooks R. EuroQol: the current state of play. Health Policy. 1996;37(1):53-72.
6. Brazier J, Roberts J, Deverill M. The estimation of a preference-based measure of health from the SF-36. Journal of Health Economics. 2002;21(2):271-92.
7. Richardson J, Iezzi A, Khan MA, Maxwell A. Cross-national comparison of twelve quality of life instruments: MIC Paper 2, Research Paper 78 2012 [cited 2015 April 15]. Available from: http://www.buseco.monash.edu.au/centres/che/pubs/researchpaper78.pdf.
8. Diener E. Subjective well-being: The science of happiness and a proposal for a national index. American Psychologist. 2000;55(1):34-43.
9. Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction With Life Scale. Journal of Personality Assessment. 1985;49(1):71-5.
10. Marmot M, Allen J, Bell R, Bloomer E, Goldblatt P. WHO European review of social determinants of health and the health divide. The Lancet.380(9846):1011-29.
11. Laaksonen M, Rahkonen O, Martikainen P, Lahelma E. Socioeconomic Position and Self-Rated Health: The Contribution of Childhood Socioeconomic Circumstances, Adult Socioeconomic Status, and Material Resources. American Journal of Public Health. 2005;95(8):1403-9.
12. Robards J, Evandrou M, Falkingham J, Vlachantoni A. Marital status, health and mortality. Maturitas. 2012;73(4):295-9.
13. Musick K, Bumpass L. Cohabitation, Marriage, and Trajectories in Well-Being and Relationships. 2006.
14. Global status report on noncommunicable diseases 2010. Geneva: World Health Organization, 2010.
15. WHO Expert Committee on Problems Related to Alcohol Consumption. World Health Organization, 2006.
16. Kearns B, Ara R, Young T, Relton C. Association between body mass index and health-related quality of life, and the impact of self-reported long-term conditions - cross-sectional study from the south Yorkshire cohort dataset. BMC public health. 2013;13:1009.
17. Ul-Haq Z, Mackay DF, Fenwick E, Pell JP. Meta-analysis of the association between body mass index and health-related quality of life among adults, assessed by the SF-36. Obesity (Silver Spring, Md). 2013;21(3):E322-7.
18. Cherepanov D, Palta M, Fryback DG, Robert SA, Hays RD, Kaplan RM. Gender Differences in Multiple Underlying Dimensions of Health-Related Quality of Life are Associated with Sociodemographic and Socioeconomic Status. Medical care. 2011;49(11):1021-30.

19. Hanmer J, Lawrence WF, Anderson JP, Kaplan RM, Fryback DG. Report of Nationally Representative Values for the Noninstitutionalized US Adult Population for 7 Health-Related Quality-of-Life Scores. Medical Decision Making. 2006;26(4):391-400.
20. Cherepanov D, Palta M, Fryback DG, Robert SA. Gender differences in health-related quality-of-life are partly explained by sociodemographic and socioeconomic variation between adult men and women in the US: evidence from four US nationally representative data sets. Quality of Life Research. 2010;19(8):1115-24.
21. Frijters P, Beatton T. The mystery of the U-shaped relationship between happiness and age. Journal of Economic Behavior & Organization. 2012;82(2–3):525-42.
22. Oishi S. The concept of life satisfaction across cultures: An IRT analysis. Journal of Research in Personality. 2006;40(4):411-23.
23. Age-standardized Alcohol use disorders (15+), 12 month prevalence (%) by country: WHO, Global Information System on Alcohol and Health; [cited 2015 April, 27]. Available from: http://apps.who.int/gho/data/node.main.A1425?lang=en&showonly=GISAH.
24. Davis CG, Thake J, Vilhena N. Social desirability biases in self-reported alcohol consumption and harms. Addict Behav. 2010;35(4):302-11.

APPENDIX:

Table 7; Regression with physical activity duration:

		EQ-5D	SF 6D	VAS	SWLS
Education (ref "high school"	Diploma	0.002	- 0.003	0.001	0.013*
		(0.0043)	(0.0031)	(0.0048)	(0.0048)
	University	0.005	0.002	0.010	0.024*
		(0.0047)	(0.0034)	(0.0052)	(0.0053)
Standard of living (ref "poor")	Very good	0.168*	0.129*	0.200*	0.354*
		(0.0066)	(0.0045)	(0.0073)	(0.0074)
	Good	0.120*	0.078*	0.127*	0.213*
		(0.0058)	(0.0040)	(0.0064)	(0.0065)
Living with a partner (ref "no)	Yes	0.002	0.004	0.015*	0.048*
		(0.0038)	(0.0027)	(0.0042)	(0.0043)
Smoking (ref "no)	Yes	- 0.015*	-0.010*	- 0.016*	- 0.009*
		(0.0043)	(0.0031)	(0.0048)	(0.0049)
Drinking intensity (ref "non-drinker")	4 or less	0.029*	0.013*	0.024*	0.002
		(0.0049)	(0.0031)	(0.0048)	(0.0048)
	5 or more	0.041*	0.015*	0.025*	- 0.012
		(0.0071)	(0.0051)	(0.0079)	(0.0080)
BMI (ref "<25")	25-30	- 0.007	- 0.005*	- 0.007	- 0.009*
		(0.0044)	(0.0032)	(0.0049)	(0.0050)
	30 <	- 0.031*	- 0.020*	- 0.045*	- 0.008
		(0.0046)	(0.0033)	(0.0051)	(0.0052)
Physical activity duration (ref "No ")	< 15 minutes	0.074*	0.035*	0.057*	0.030*
		(0.0061)	(0.0044)	(0.0068)	(0.0069)
	15-29 minutes	0.107*	0.059*	0.091*	0.048*
		(0.0057)	(0.0041)	(0.0063)	(0.0064)
	30-60 minutes	0.119*	0.073*	0.112*	0.051*
		(0.0055)	(0.0040)	(0.0061)	(0.0062)
	> 60 minutes	0.125*	0.086*	0.114*	0.051*
		(0.0069)	(0.0050)	(0.0077)	(0.0077)
Gender (ref "male")	Female	- 0.006	- 0.014*	0.015*	0.013*
		(0.00376)	(0.00270)	(0.00416)	(0.00421)
Age group (ref "18-34")	35-44	- 0.019*	0.004	- 0.014*	- 0.020*
		(0.0064)	(0.0046)	(0.0071)	(0.0072)
	45-54	- 0.030*	0.008*	- 0.013*	- 0.013*
		(0.0060)	(0.0043)	(0.0066)	(0.0067)
	55-64	- 0.029*	0.016*	- 0.005	0.005
		(0.0060)	(0.0043)	(0.0066)	(0.0067)
	65 +	- 0.006	0.027*	0.021*	0.039*
		(0.0063)	(0.0045)	(0.0070)	(0.0071)
Constant		0.719*	0.650*	0.600*	0.377*
		(0.0107)	(0.0077)	(0.0118)	(0.0120)
Observations		7,521	7,521	7,521	7,521
R-squared		0.347	0.360	0.375	0.404