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DISCUSSION PAPER 190

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Abstract

Study Objectives: This paper explores the relationship between body mass index (BMI) and health-related quality of life (HRQoL), measured using EQ-5D, for men and women within a national population sample.

Methods: Data were taken from the 1996 Health Survey for England, an annual survey commissioned by the UK Department of Health. HRQoL was measured using EQ-5D. Informants' BMI was calculated from height and weight measurements collected by trained nurses. Details of any long-standing illness were also collected. Complete data was available for 11,783 cases aged 18 years or more.

Main Results: There were significant differences in EQ-5D by BMI category, although the nature of the relationship between EQ-5D and BMI differed by gender. For women, significant differences in EQ-$5D_{index}$ could be observed for each BMI category, which was independent of age and the presence of long-standing illness. For men, being classified within the obese BMI range was associated with poor EQ-$5D_{index}$ score, although this relationship disappeared after accounting for age and long-standing illness. The EQ-5D pain and mobility dimensions showed the greatest change in reported problems with increasing BMI. Analysis showed little relationship between BMI and the EQ-5D anxiety/depression dimension.

Discussion: Most of the apparent relationship between BMI and HRQoL could be accounted for by age and the presence of long-standing illness. However women's HRQoL did appear to be sensitive to their weight. Further investigation of the nature of the gender differences in the relationship between BMI and HRQoL would be useful.

Keywords: EQ-5D, UK, gender differences

1. Introduction

Overweight and obesity is recognised as a rapidly growing threat to the health of populations in developed countries. The prevalence of obesity is between 10-25% in Western industrialised countries and is becoming a growing problem in other areas of the world [1]. Latest figures for the UK indicate that 19% of adults are obese [2] and it has been predicted that by 2005 over one fifth of men and about a quarter of women will be obese [3].

Overweight and obesity are associated with an increased risk of mortality at all ages and are recognised as a major determinant of many non-communicable diseases including type 2 diabetes (in particular), cardiovascular disease, hypertension, gall bladder disease, several types of cancers and degenerative joint disease [4-12]. In addition they are also associated with a significant degree of poor mental health [13, 14]. Individuals with a BMI that is lower than that considered the desirable range (i.e. < 21-25kg/m^2) are also at increased risk of poor health, although most of the excess morbidity suffered by this group has been attributed to smoking and pre-existing disease [15].

There is some evidence that having a BMI that is classified as overweight or obese (i.e. over 25kg/m^2) has a greater impact on the risk of disease for women than for men [12]. Among women, obesity is the third most important predictor of cardiovascular disease after age and blood pressure [4], while obese women are more likely to die of diabetes than overweight men [16]. An American Cancer Society report found that the mortality ratio for all cancers was 1.33 for obese men and 1.55 for obese women [17]. Obesity has also been associated with problems with fertility, pregnancy and childbirth [18].

Compared to the extensive body of research on the relationship between obesity and mental and physical disease there has been relatively little work on the relationship between obesity and health-related quality of life (HRQoL), although in recent years the number of studies has been steadily increasing. A number of measures have specifically been developed to examine the effect of weight on HRQoL [19, 20, 21]. However, the majority of work in this area has tended to use the SF-36 [22] as the measure of HRQoL.

Increasing weight and obesity has been shown to have an impact on the physical aspects of HRQoL such as role functioning, mobility and bodily pain. Two studies of the general population have shown that individuals with a BMI of more than 30kg/m^2 have significantly poor health on those dimensions of the SF-36 related to physical health and functioning [20, 23]. Obese individuals have also been shown to be more likely to rate their overall health as poor, to report more limitations on their functional health and report significantly higher levels of pain compared to the general population [24, 25]. Weight gain has been also associated, amongst women, with poorer HRQoL in terms of physical functioning, vitality and pain, while weight loss was associated with improved scores in the same areas [26].

Although an association between overweight and obesity and poor mental wellbeing is frequently claimed, the research evidence tends to be mixed. Studies that have found a relationship have tended to comprise samples of patients receiving treatment for obesity [13, 19, 26, 27]. In contrast, studies of the general population have shown little or no relationship between increased weight and poor emotional or social well being [20, 23]. It has been suggested that obesity is associated with poor emotional health only when it is accompanied by other chronic conditions [23, 28]. However,

there do appear to be gender differences in the impact of weight on psychological health. Increased weight has been reported to have a greater impact on self-esteem and sexual life for women than for men [19], and increasing body weight has been associated with greater body dissatisfaction and lower self-esteem among women than men [29]. The existence of gender differences in the relationship between weight, body image and self-esteem are also well established [30, 31].

HRQoL data is playing an increasingly important role in the evaluation of treatments for chronic disease states such as obesity. Economic evaluation and cost utility analysis in particular rely on HRQoL data as a quality adjustment index when computing QALYs. However, the relationship between HRQoL and BMI is still not fully understood. This paper explores the relationship between BMI and EQ-5D, a widely used generic measure of HRQoL, in a British population sample. It has two aims: firstly to determine the extent to which EQ-5D discriminates between individuals according to their BMI; and secondly to explore the extent to which this relationship is modified by gender and the presence of other chronic conditions.

2 Methods

2.1 Data

The Health Survey for England (HSE) is an annual large scale survey commissioned by the UK Department of Health and covers a representative sample of the population of England aged two years or more living in private households. The EQ-5D was included in the 1996 survey and the data presented in the following report is taken from that year, during which survey interviews were obtained with 15,924 adults aged 18 years or more [32].

2.2 EQ-5D

EQ-5D was designed as a general-purpose instrument for use in clinical and economic studies as well as for monitoring population health status [33]. EQ-5D measures a person's health in terms of their responses on five dimension questions (mobility, self-care, usual activities, pain or discomfort and anxiety or depression) and their self- rating of their health (from worst imaginable to best imaginable) on a visual analogue scale. EQ-5D allows for an individual's health status to be expressed in three ways: as a health profile of their responses on the five dimensions, as a single weighted summary score ($EQ\text{-}5D_{index}$) and as a score on the visual analogue scale ($EQ\text{-}5D_{vas}$).

Informants in the 1996 HSE were classified into one of the 243 hypothetical health states defined by EQ-5D, and assigned the appropriate weighted health state index score ($EQ\text{-}5D_{index)}$. Four hundred and thirty-four informants (3%) were excluded from the analysis because a value for $EQ\text{-}5D_{index}$ could not be computed. Informants in the 1996 HSE survey were not required to complete the EQ-5D visual analogue scale.

2.3 BMI

Trained nurses recorded informant's height and weight. The data collection procedures are documented in detail elsewhere [34]. Respondents were categorised into three and five category BMI classifications as follows: three categories <26kg/m^2 desirable range; 26-30kg/m^2 overweight range; >30kg/m^2 obese range; five categories <21kg/m^2 underweight range; 21-25kg/m^2 desirable range; 26-30kg/m^2 overweight range; 31-39kg/m^2 obese range; >39kg/m^2 morbidly obese range.
BMI could not be calculated for 3876 (24%) informants.

2.4 Long-standing illness

Informants were asked to give details about any long-standing illness, disability or infirmity that had troubled them over a period of time. A maximum of six conditions was recorded.

2.5 Statistical analysis

4,141 cases (26%) with missing EQ-5D or BMI data were excluded leaving a sample size of 11,783. Data were analysed separately for men and women. ANOVA was used to test for differences in EQ-5D index score and reported problems on each dimension by BMI category. The relationship between BMI and EQ-5D weighted health state index score (EQ-5D$_{index}$) was also modelled using ordinary least squares regression. EQ-5D$_{index}$ was the dependent variable; age group, BMI category and number of long-standing illnesses were the independent variables. Age group was defined as a 7 category variable (18-24 years, 25-34 years, 35-44 years, 45-54 years, 55-64 years, 65-74 years, 75+ years); BMI was defined as a 3 or 5 category variable and long-standing illness as a 5 category variable (no long-standing illness, 1 long-standing illness, 2 long-standing illnesses, 3 long-standing illnesses, 4+ long-standing illnesses). The relationship between BMI category and likelihood or reporting problems on each of the EQ-5D dimensions was explored using multivariate analysis of variance (MANOVA), controlling for age and number of comorbidities. EQ-5D dimension responses were recoded as dichotomous variables indicating no problems (0) and some problems (1). Tukey tests were used to determine any significant group means post hoc.

3. Results

3.1 Sample characteristics

54% of the sample was female, the median age was 46 years (age range 18-97 years). In terms of age and sex there were no significant differences between the sample and the HSE 1996 adult sample as a whole. Just over two fifths of the sample reported having a long-standing illness. The mean BMI for men was 26.6kg/m^2 (S.D. 4.05) and for women 26.3kg/m^2 (S.D. 5.04). For both men and women, BMI gradually increased with age to peak at age 55-64 years. There was an increasing prevalence of long-standing illness with increasing BMI. Slightly more than a third (38%) percent of men and women with a BMI in the desirable range reported at least one long-standing illness compared to around half (49% of men and 55% of women) with a BMI in the obese range.

3.2 EQ-5D and BMI

Table 1 shows the proportion reporting problems on each of the EQ-5D dimensions by BMI category for men and women. There were significant differences in the proportion of reported problems by BMI category across all the dimensions, except anxiety/depression. The proportion reporting problems on all dimensions increased as BMI increased above the desirable range. The pain/discomfort and mobility dimensions tended to show the greatest increase in the proportion of reported problems and the anxiety/depression dimension showed the least increase. Respondents classified as within the underweight BMI range also tended to report more problems, than those in the desirable range.

Table 1: Percent reporting problems on EQ-5D by BMI category and sex

	<21kg/m^2	21-5kg/m^2	26-30kg/m^2	31-39kg/m^2	>39kg/m^2	Total	F
Men							
Mobility							
None	86.0	87.3	89.2	76.0	76.9	84.2	**<0.001**
Some	14.0	12.7	15.8	24.0	23.1	15.8	
Severe	--	<0.1	--	--		<0.1	
Self care							
none	92.1	96.5	95.5	93.2	96.2	95.4	**<0.01**
Some	7.4	3.2	4.3	6.5	3.8	4.3	
Severe	0.5	0.3	0.2	0.3	--	0.3	
Usual activities	80.9						**<0.01**
None		85.4	83.1	78.9	80.8	83.3	
Some	15.8	13.0	14.6	17.8	19.2	14.6	
Severe	3.3	1.6	2.2	3.2	--	2.1	
Pain							**<0.001**
None	73.5	69.6	64.3	58.4	76.9	65.9	
Some	23.7	28.3	32.9	36.5	19.2	31.2	
Severe	2.8	2.1	2.8	5.1	3.8	2.9	
Mood							**Ns**
none	77.7	80.2	80.9	79.6	73.1	80.3	
some	20	18.1	17.9	18.5	26.9	18.2	
severe	2.3	1.7	1.3	1.9	--	1.6	
N	215	2066	2356	779	26	5442	
Women							
Mobility							
None	84.2	88.3	79.2	69	61.7	81.5	**<0.001**
Some	15.8	11.6	20.7	31.0	38.3	18.5	
Severe	--	<0.1	0.1	--	--	<0.1	
Self care							
none	94.0	97.2	95.2	92	85.2	95.3	**<0.001**
Some	5.6	2.6	4.4	7.7	14.8	4.5	
Severe	0.4	0.1	0.4	0.3	--	0.3	
Usual activities							**<0.001**
None	81.3	85.4	78.2	74.1	67.0	80.6	
Some	16.5	13.2	19.0	22.6	30.4	17.1	
Severe	2.3	1.4	2.8	3.3	2.6	2.2	
Pain							**<0.001**
None	69.4	67.5	57.8	51.0	46.1	61.5	
Some	28.1	30.3	38.0	42.5	45.2	34.8	
Severe	2.5	2.2	4.1	6.4	8.7	3.6	
Mood							**<0.05**
None	69.6	76.6	74.2	73.6	71.3	74.8	
Some	27.9	22	23.6	24.0	27.8	23.4	
Severe	2.5	1.4	2.1	2.4	0.9	1.9	
N	480	2719	1988	1039	115	6341	

Table 2 presents mean EQ-5D$_{index}$ score by BMI and age group for men and women. For men, BMI appears to have little relationship with EQ-5D$_{index}$ score. In contrast for women aged 35 years or more, there was a significant relationship between increasing BMI and decreasing EQ-5D$_{index}$ score.

Table 2: Mean (standard deviation) EQ-5D$_{index}$ score by BMI age group and sex

BMI	<21 kg/m^2	21-25 kg/m^2	26-30 kg/m^2	31-39 kg/m^2	>39 kg/m^2	Sig. of F test
Men						
18-24 yrs	0.91 (0.17)	0.92 (0.15)	0.92 (0.19)	0.86 (0.21)	1.0 (-)	**0.483**
N	77	304	120	32	2	
25-34 yrs	0.90 (0.24)	0.91 (0.15)	0.92 (0.14)	0.89 (0.20)	0.97 (0.07)	**0.328**
N	51	474	391	112	5	
35-44 yrs	0.82 (0.23)	0.91 (0.15)	0.89 (0.18)	0.89 (0.19)	0.90 (0.18)	**0.152**
N	21	427	485	147	7	
45-54 yrs	0.87 (0.18)	0.87 (0.23)	0.86 (0.21)	0.84 (0.23)	0.80 (0.32)	**0.571**
N	27	319	480	170	7	
55-64 yrs	0.75 (0.33)	0.82 (0.25)	0.81 (0.25)	0.72 (0.32)	0.87 (0.22)	**0.003**
N	11	212	372	161	3	
65-74 yrs	0.71 (0.27)	0.81 (0.25)	0.81 (0.24)	0.78 (0.26)	0.76 (0.34)	**0.476**
N	22	195	344	103	2	
75+ yrs	0.80 (0.27)	0.76 (0.22)	0.77 (0.22)	0.76 (0.23)	--	**0.748**
N	11	147	(166)	54		
All Ages	0.86 (0.23)	0.87 (0.20)	0.86 (0.21)	0.82 (0.25)	0.88 (0.22)	
N	220	2078	2358	779	26	
Sig. of F test	**0.004**	**0.000**	**0.000**	**0.000**	**0.735**	
Women						
18-24 yrs	0.90 (0.16)	0.90 (0.16)	0.90 (0.16)	0.88 (0.21)	0.93 (0.11)	**0.913**
N	112	341	116	48	8	
25-34 yrs	0.88 (0.21)	0.92 (0.15)	0.91 (0.16)	0.88 (0.19)	0.90 (0.14)	**0.088**
N	116	607	295	153	22	
35-44 yrs	0.89 (0.18)	0.89 (0.18)	0.86 (0.20)	0.82 (0.25)	0.81(20)	**0.000**
N	85	591	308	176	22	
45-54 yrs	0.89 (0.13)	0.86 (0.19)	0.83 (0.23)	0.83 (0.19)	0.76 (0.27)	**0.025**
N	44	473	403	186	22	
55-64 yrs	0.76 (0.27)	0.83 (0.22)	0.78 (0.27)	0.74 (0.30)	0.54 (0.38)	**0.000**
N	35	264	322	190	18	
65-74 yrs	0.79 (0.22)	0.82 (0.21)	0.76 (0.25)	0.71 (0.28)	0.68 (0.21)	**0.000**
N	52	242	324	172	18	
75+ yrs	0.64 (0.31)	0.76 (0.23)	0.73 (0.26)	0.68 (0.31)	0.53 (0.28)	**0.004**
N	42	212	227	115	5	
All Ages	0.85 (0.22)	0.87 (0.19)	0.82 (0.23)	0.78 (0.26)	0.75 (0.27)	
N	486	2730	1995	1040	115	
Sig. of F test	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	

3.3 Modelling the relationship between EQ-5Dindex and BMI

BMI category and age group were entered into an OLS regression with EQ-5D$_{index}$ as the dependent variable (table 3). For men, being classified within the obese BMI range was associated with a significantly lower EQ-5D$_{index}$ score (model A). There was also an increasingly negative relationship between EQ-5D$_{index}$ score and age group. For women, having a BMI which was higher than the desirable BMI range had a significant negative effect on EQ-5D$_{index}$ score (model C). As for men there was also an increasing effect with increasing age. The model for women was re-estimated with BMI as a 5 category variable (model D). This model showed that women with a BMI both above and below the desirable range had significantly decreased EQ-5D$_{index}$ scores, and there was an increasingly negative effect with increasing BMI.

Number of long-standing illnesses was also added to the model along with BMI and age group. For men (model B), the presence of a long-standing illness had a large negative effect on EQ-$5D_{index}$ score. However, men who were classified within the obese BMI range no longer had significantly lower scores than men with a lower BMI.

For women (model E), although the presence of long-standing illness had a similarly significant effect on EQ-$5D_{index}$ score, being classified within the overweight or obese BMI ranges still had a significantly negative effect on women's EQ-$5D_{index}$ scores. As before, the model for women was re-estimated with BMI as a 5 category variable (model F). The same pattern remained i.e. being classified to anything other than the desirable BMI range had a small but significant negative impact on women's EQ-$5D_{index}$ scores, independent of age and the presence of long-standing illness and this relationship was increasingly negative with increasing body weight.

Interactions between BMI and age group and number of long-standing illnesses were explored. None improved the overall goodness of fit of the model and as such are not reported here.

Table 3: Modelling the relationship between BMI category and EQ-$5D_{index}$ score.

	Men Model A		**Men model B**		**Women model C**		**Women model D**		**Women Model E**		**Women model F**	
Independent variables	β	Sig.	*β*	*Sig.*	*β*	*Sig.*	*β*	*Sig.*	*β*	*Sig.*	*β*	*Sig.*
BMI												
<26kg/m^2	Base		Base		Base				Base			
26-30kg/m^2	0.002	Ns	0.005	Ns	-0.02	<0.001			-0.01	<0.05		
>30kg/m^2	-0.03	<0.001	-0.01	Ns	-0.06	<0.001			-0.04	<0.001		
BMI												
<21 kg/m^2							-0.03	<0.05			-0.02	<0.05
21-25 kg/m^2							Base				Base	
26-30 kg/m^2							-0.02	<0.001			-0.02	<0.01
31-39 kg/m^2							-0.06	<0.001			-0.04	<0.001
>39 kg/m^2							-0.11	<0.001			-0.06	<0.01
Age group												
18-24 yrs	Base		Base		Base		Base		Base			
25-34 yrs	0.0001	Ns	0.0005	Ns	0.0009	Ns	0.0008	Ns	0.0006	Ns	0.0005	Ns
35-44 yrs	-0.01	Ns	0.001	Ns	-0.02	<0.05	-0.03	<0.05	-0.01	Ns	-0.01	Ns
45-54 yrs	-0.05	<0.05	-0.02	<0.05	-0.04	<0.001	-0.05	<0.001	-0.02	<0.05	-0.02	<0.05
55-64 yrs	-0.114	<0.001	-0.05	<0.001	-0.106	<0.001	-0.108	<0.001	-0.04	<0.001	-0.04	<0.001
65-74 yrs	-0.110	<0.001	-0.03	<0.05	-0.117	<0.001	-0.119	<0.001	-0.04	<0.001	-0.04	<0.001
75+ yrs	-0.136	<0.001	-0.04	0.000	-0.165	<0.001	-0.167	<0.001	-0.07	<0.001	-0.08	<0.001
Long-standing illness												
No illness			Base						Base		Base	
1			-0.117	<0.001					-0.115	<0.001	-0.115	<0.001
2			-0.193	<0.001					-0.196	<0.001	-0.196	<0.001
3			-0.313	<0.001					-0.283	<0.001	-0.284	<0.001
4 or more			-0.444	<0.001					-0.428	<0.001	-0.427	<0.001
Constant	0.915	<0.001	0.948	<0.001	0.910	<0.001	0.916	<0.001	0.946	<0.001	0.951	<0.001
Adj R^2	0.06		0.26		0.08		0.08		0.26		0.26	

3.4 Multivariate analysis of the relationship between BMI and EQ-5D dimension

The relationship between BMI and each EQ-5D dimension simultaneously was explored for men and women separately using MANOVA. Based on the results from the previous models, BMI was defined as a three category variable for men and a five category variable for women.

Analysis for men (table 4) revealed that BMI had a small but significant effect on the dependent variables (controlling for age and number of comorbidities). BMI accounted for 0.3% of the variance in the dependent variables (partial η^2=0.003). Post hoc tests showed that men who were classified to the obese BMI range were more likely than other men to report problems on the mobility, self-care, usual activities and pain/discomfort dimensions. Men with a BMI in the overweight range reported significantly more problems on the mobility and pain dimensions than men in the desirable range. The likelihood of reporting problems on the anxiety/depression dimension was not associated with BMI.

Table 4: MANOVA of relationship between BMI and each EQ-5D dimension simultaneously for men and women

	F[a]	Sig.	Partial η^2
Men			
BMI	3.58	<0.001	0.003
Number of long-standing illnesses	60.53	<0.001	0.06
Age group	13.6	<0.001	0.01
Intercept	352.73	<0.001	0.24
Women			
BMI	7.86	<0.001	0.006
Number of long-standing illnesses	64.43	<0.001	0.06
Age group	17.32	<0.001	0.02
Intercept	467.35	<0.001	0.27

[a] Wilks' λ

For women, BMI accounted for 0.6% (partial η^2=0.006) of the variance in the dependent variables after controlling for age and comorbidities (table 4). Post hoc tests showed that women with a BMI which was either higher or lower than the desirable range were more likely to report problems on the self-care dimension, and women with a BMI within the overweight and obese ranges were at increased risk of reporting problems on the mobility, self-care and usual activities dimensions. Women who were classified within the underweight BMI range were the only group at increased risk of reporting more problems on the anxiety/depression dimension.

4. Discussion

This study reports on the relationship between BMI and health-related quality of life as measured by EQ-5D within a national population sample. Results revealed significant differences in EQ-5D according to BMI category, the nature of which differed according to gender and long-standing illness.

Significant differences in the EQ-5D weighted index score could be observed according to BMI category for women but not men. Amongst women, being categorised within anything other than the desirable BMI range (i.e. <21kg/m^2 or >25kg/m^2) was associated with significantly lower EQ-$5D_{index}$ scores, which remained after controlling for age and long-standing illness. For men, being classified within the obese BMI range was associated with significantly lower EQ-$5D_{index}$ scores, although this relationship was not significant after accounting for long-standing illness. Men who were classified within the underweight or overweight BMI ranges did not appear to experience any worse health than men who were classified as a desirable weight.

Examination of the relationship between BMI category and the five EQ-5D dimensions showed that there was a significant increase in the proportion of individuals reporting problems on each dimension as BMI moved either above or below desirable weight. The exception was the anxiety/depression dimension, which showed little association with BMI. Controlling for age and long-standing illness revealed that men who were classified within the obese BMI range were more likely than men with a lower BMI to report problems on all the dimensions except anxiety/depression, while men who were classified within the overweight range were more likely than men within the desirable BMI range to report problems on the mobility and pain dimensions. For women, there was an increasing association between BMI and likelihood of reporting problems across all the EQ-5D dimensions (except anxiety/depression) even after controlling for age and long-standing illness.

There was no evidence of a link between overweight and poor psychological health as measured by the EQ-5D anxiety/depression dimension. Men and women who were classified as overweight or obese were no more likely to report problems on this dimension than men or women in the desirable BMI range. However, women who were classified as underweight were more likely to report problems with anxiety/depression than women with a higher BMI. The results are consistent with other reports [23] that suggest that the health burden in obesity is primarily physical in nature and tends to be experienced in terms of problems with pain and restricted mobility along with associated problems in functioning and daily activities.

There is a considerable literature to indicate that women attribute more importance to their bodyweight than men and that weight is more closely associated to self-esteem in women than men [e.g. 19, 29, 30, 34]. The findings presented here also suggest that women are more likely than men to experience poorer health if they deviate from what is considered a desirable weight, independent of age or presence of long-standing illness. Gender differences in the relationship between BMI and functional limitation have also been reported elsewhere [35]. The underlying mechanism behind the gender discrepancy observed here is unclear. One interpretation is that negative attitudes about their weight may bias women's perceptions or reports of their health. Another possibility is that the poor health observed for women in these BMI categories represents future disease which has not yet been diagnosed or recognised. Women may be more aware of or more likely to

report symptoms than men, or possibly more at risk of developing symptoms than men with a similar BMI. However, it should also be noted that although significant, the relationship between BMI and EQ-5D for both men and women was very small compared to the relationship between EQ-5D and both long-standing illness and age.

Two advantages of the Health Survey for England data presented here are the large sample size and the fact that the height and weight data were collected by trained nurses, rather than relying on self report, which is known to be prone to bias [36]. Two disadvantages are the cross-sectional nature of the data, which limits any conclusions about the causal nature of the results, and the fact that the dataset does not include the EQ-5D visual analogue scale. $EQ\text{-}5D_{vas}$ has been shown to discriminate between individuals with respect to their self-reported health, self-reported illness and socio-demographic status as well as, if not better than, other measures [37]. Unfortunately it is often omitted by researchers.

Most studies of the relationship between BMI and health-related quality of life have not analysed data for men and women separately. However, these findings suggest that BMI relates to HRQoL differently according to gender. A recent review of the effectiveness of obesity treatment [38] also suggests that it may be necessary for clinical trials to stratify their results according to gender. Further investigation of the nature of the gender differences in the relationship between BMI and health-related quality of life would be useful.

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