

Normative data for the Hospital Anxiety and Depression Scale

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Purpose

The Hospital Anxiety and Depression Scale (HADS) is widely used in both research and clinical contexts. However UK normative data from HADS remains limited. In our recent review of the literature, only six reports from four studies were identified as reporting UK normative data and all had limitations. The aim of our study was to use a large population-based dataset to address this.

Methods

The Epidemiology of Functional Disorders Study is a large longitudinal population-based study carried out in Northwest England. All adults aged between 25 and 65 years registered with three general practices were sent a self-completion questionnaire which contained the HADS and other health-related instruments.

Scores were calculated for participants completing all items on each sub-scale (anxiety 6189 participants, depression 6198 participants). Scores are presented by gender and by 5-year age-groups. Percentile scores were also generated.

Results

The median anxiety score was higher in women (6, IQR 4 to 9) than in men (5, IQR 2 to 8), and increased with age in both groups. The median depression score for both women and men was 3 (IQR 1 to 6).

Conclusions

Our study is the largest population-based study providing UK normative data from HADS. While our data confirms some of the normative data reported previously, subtle and important differences emerged, particularly at the upper end of the percentile scores. Due to the nature of our study design and the number of

participants sampled, we believe that our data is likely to be more representative of the UK population than existing published normative values.

Introduction

Patient reported outcome measures (PROMs) are extensively used in research and medical practice to assess clinical outcomes such as health-related quality of life [1, 2]. They are a subjective measure and assess the outcome or health parameter from the patient's own perspective [1, 2]. In the field of mental health, PROMs have been shown to provide unique and invaluable information [3]. One such instrument is the Hospital Anxiety and Depression Scale (HADS) [4].

The HADS was originally developed by Zigmond and Snaith as a screening tool to capture clinically significant states of anxiety and depression in a non-psychiatric hospital setting [4]. The HADS was therefore designed to be a brief, 14-item, self-assessment scale that was easily understandable and capable of distinguishing between these emotional states [5].

The anxiety and depression sub-scales each consist of seven items with each item having four possible answers scored 0, 1, 2 or 3. Individual anxiety and depression scores are calculated by summation of the appropriate seven items and thus can range from zero to twenty-one, with higher scores indicating higher levels of anxiety or depression respectively.

In their initial publication, Zigmond and Snaith used clinical assessments to recommend that a score of 0 to 7 on either sub-scale should be defined as a 'non-case' (later defined as 'normal'), a score of between 8 and 10 defined as a 'doubtful case' (later defined as a 'mild case') and a score of more than or equal to 11 defined as a 'definitive case' of anxiety or depression [4]. However they emphasised that further research would be required to validate the suggested cut-off scores in different clinical settings. Furthermore, in a more recent publication, the authors suggest a third cut-off point, where a score of between 11 and 14 is defined as a

'moderate' case and a score of between 15 and 21 as a 'severe' case of anxiety or depression [5]. However, no empirical data was presented on the usefulness of this later cut-off score [5, 6].

Since its development the HADS has become a commonly used instrument in both research and clinical practice. For example, a review published by Herrman in 1997 identified over 200 published papers which reported on the use of HADS in approximately 35,000 participants [6]. The studies were conducted in 26 different countries; the questionnaire translated into 33 different languages; and was used in many different medical settings, for example general medicine, oncology and cardiology. An updated review by Bjelland *et al* in 2002 reported that the number of papers reporting HADS had since increased almost fourfold, highlighting the continued use of the questionnaire in both standard medical practice and in health-related research [7].

Despite its frequent use, normative data (i.e. data collected from a representative sample of the general population against which all subsequently collected data can be compared) has remained limited. Our recent review of the literature identified only twenty papers that could be described as reporting normative data from HADS [8-27]. The studies were conducted mainly in Europe, included sample sizes ranging from 94 [17] to 62,344 [13] participants and were sourced using a variety of different techniques, for example all residents in a particular region/country [13, 17, 19], a stratified random sample of three age cohorts [12, 20] and adults registered with a particular Primary Care practice [8, 10, 14].

Only six reports from four studies included UK participants [8, 12, 14, 15, 20, 24]. All reports had limitations, mainly in terms of sample size and/or sample selection. One of these studies [15] is recommended by the current licence holder (GL Assessment)

as appropriate normative data for the UK. However the sampling technique employed in this study (participants were drawn from commercial and public service organisations, community centres and recreational clubs) means that the data is unlikely to be representative of the general population, as it may only include those in employment or engaged in community activities, who may have different psychological morbidity from those that are not.

The aim of the current study was to establish normative HADS data for the UK population using data from a large population based study which is likely to be representative of the UK population.

Methods

The Epidemiology of Functional Disorders (EpiFunD) Study is a large longitudinal population-based study carried out in Northwest England, the design and primary results of which have been published previously [28, 29]. In brief, at baseline, all patients registered with one of three general practices (although not necessarily attending for treatment) were sent a self-completion questionnaire in 2001/02. The practices were from different socio-economic areas, as assessed by the Townsend index – a census-derived index of indicators of home ownership, car ownership, unemployment and overcrowding [30]. The questionnaire included the HADS and other health related instruments. Two weeks after the initial mailing, non-participants were sent a reminder postcard, with another full questionnaire sent two weeks subsequently to those who had still not responded. The study was approved by South Manchester local research ethics committee and South Cheshire local research ethics committee.

In this analysis, we report baseline data. All analyses were performed using the statistical package Stata Version 10.0 (StataCorp, College Station, TX). To estimate

the representativeness of the EpiFunD sample, the age and gender profiles of the sample was compared to UK national estimates (2001 Census data [31]). The internal validity of the sample were then assessed by comparing response rates by gender and age using the Chi-Square test.

Anxiety and Depression scores

Anxiety and depression scores were calculated for those who had completed all items on the anxiety and depression sub-scales respectively (complete case analysis). A priori, we hypothesised that scores would differ by gender and age [8-27]; this was confirmed in the initial analysis and thus results are presented for females and males separately, and within gender, by 5-year age-group.

As the anxiety and depression scores were skewed towards lower scores (positively skewed distribution), median scores with the associated Interquartile Range (IQR) were deemed the most appropriate descriptive statistic to present. However to aid comparisons with other studies, data is presented here in four ways: (1) median scores with IQRs; (2) the proportion of patients in each of Zigmond and Snaith's [4] original normal, mild and moderate to severe classifications; (3) percentile scores and; (4) mean scores with the associated Standard Deviations (SD).

Results

Profile of EpiFunD sample versus Census data

The EpiFunD baseline questionnaire was issued to 10,987 adults and had a response rate of 68.2% (after adjusting for deaths and those not resident at the given address) [30]. Of those issued with the questionnaire, 50.2% were female and 49.8% were male. These proportions were similar to the 2001 Census data which showed that 50.7% of UK adults aged between 25 and 65 years of age were female

[31]. The age distribution of those sent the questionnaire was also similar to that reported in the 2001 Census data [31].

Profile of responders

Response rates were higher in women (64.3%) than men (49.8%) ($p < 0.001$) and generally increased with increasing age (41.3% in the youngest group to 72.1% in the oldest group; $p < 0.001$). The participants that returned the questionnaire were also younger when compared to non-responders (mean age 45.9 (SD 11.0) versus 42.0 (SD 10.6)). The baseline characteristics of the responders are shown in Table 1.

Level of missing data

Of the 6,280 participants who completed the questionnaire, 1.4% (91) of the participants failed to complete all seven items which contribute to the anxiety score and 1.3% (82) failed to complete all seven items which contribute to the depression score. Imputation of missing data for those participants that had missed one or two items on the anxiety scale (50 and three participants respectively) or had missed one or two items on the depression scale (40 and 13 participants respectively) had minimal impact on the reported scores and prevalence rates. The results presented below are therefore based on a complete case analysis only.

Anxiety

The median anxiety scores were significantly higher among women (6, IQR 4 to 9) than among men (5, IQR 2 to 8; $p < 0.001$; Table 2). Similarly, the percentage of those classified as having 'moderate to severe' anxiety (anxiety score ≥ 11) was higher among women (19.0%) than among men (12.5%; $p < 0.001$). In both women and men, the median anxiety scores and the prevalence of 'moderate to severe' anxiety decreased with increasing age, although this was not statistically significant. The anxiety scores are presented as percentiles for women and men separately

(Figure 1). For comparison, these are plotted together with the percentile data from Crawford et al [15], the study providing the currently recommended normative data from the UK.

Depression

The median depression scores were the same for both women and men (3, IQR 1 to 6; Table 3). The percentage of those classified as having 'moderate to severe' depression (depression score ≥ 11) was also the same among women (6.9%) and men (6.9%), although the percentage of those classified as having any level of depression (depression score > 8) was higher among women (17.2%) than in men (15.4%). In both men and women, the percentage of those classed as having 'moderate to severe' depression had an apparent bell-shape with respect to age, with the highest prevalence seen in participants in their forties and early fifties. Percentile data is shown in Figure 2, and plotted together with the percentile data from Crawford et al [15].

Discussion

The EpiFunD study was used as a means to expand the available UK normative data for HADS. This study is a large population-based study that invited all adults, aged between 25 and 65 years of age, who were registered with three primary care practices in the North-West of England, to participate [32]. This invited group were shown to be broadly representative of the UK population in terms of age and gender when compared to the 2001 Census statistics.

Compared to men, response rates were higher in women, as were anxiety scores. Thus, combining the anxiety scores for men and women would result in artificially inflated summary measures for men and artificially reduced summary measures in woman. For this reason (and our a priori hypothesis that scores would differ by

gender), we have not combined the data and have presented summary scores for men and women separately. Response rates also varied by age, as did anxiety and depression scores, and combined these factors have the potential to distort the findings of the study if presenting single normative values across different ages and genders.

Strengths and limitations of the study

A particular strength of this study is the sample size, which is more than three times greater than the study recommended as providing normative data for the UK [15] and which allows us to report summary scores by gender and 5-year age-groups.

Furthermore, we suggest that those completing the HADS as part of the EpiFunD study are likely to be more representative of the general population than participants of the study providing the currently recommended normative data from the UK [15], particularly because of the different sampling techniques. Crawford *et al* drew their sample from commercial and public service organisations, community centres and recreational clubs [15]. By comparison the EpiFunD sample was drawn from the registers of three primary care practices. It is estimated that 96% of the UK population are registered with a GP [33] and, thus, sampling from GP registers provides a convenient population sampling frame for health research and, arguably, a more appropriate population from which to derive normative values of any health instrument.

However, as the proportion of people over 60 years of age is reported to be growing faster than any other age group in the UK [34], one limitation of this study is the age range of the participants included: the EpiFunD sample only contained adults aged 25 to 65 years of age. Therefore, while this paper represents a population-based sample of adults of working age, extrapolation to older adults is limited.

Comparisons with current literature

We have confirmed some of the findings reported by Crawford *et al* [15]. For example, we report the same median anxiety and depression scores for both men and women. However, although there are similarities between our data and the data from Crawford *et al* [15], there are subtle but important differences. For example, the distributions of percentiles diverged at the upper end of the scores, with a greater proportion of the EpiFunD sample having higher scores on each of the sub-scales compared with the Crawford *et al* study [15]. There are a number of possible explanations for this. Firstly, anxiety and depression scores vary by age, and the Crawford *et al* study [15] included a higher proportion of younger participants (28% of participants were aged 18-29 years) compared to the current study (where 8% of participants were aged <30 years). However as noted previously, a strength of our study is the sample size, which allows summary scores to be calculated by gender and age group. Secondly, it is likely that those participating in the study by Crawford *et al*, by their very nature (i.e. they are participating in activities or work outside the home) have less psychological morbidity (and thus report lower anxiety and depression scores) than those who do not participate in such activities (and who may be included in our study) [35].

Conclusions

We have provided supplementary normative data for the HADS for the UK working age population (25-65 years) using data collected as part of the EpiFunD study. We believe that the data we report may be more representative of the general population than previous studies. In addition, the sample size allows data to be presented not only by gender but also by age-group. Such data will aid in the interpretation of other studies that have used the HADS as a patient reported outcome measure.

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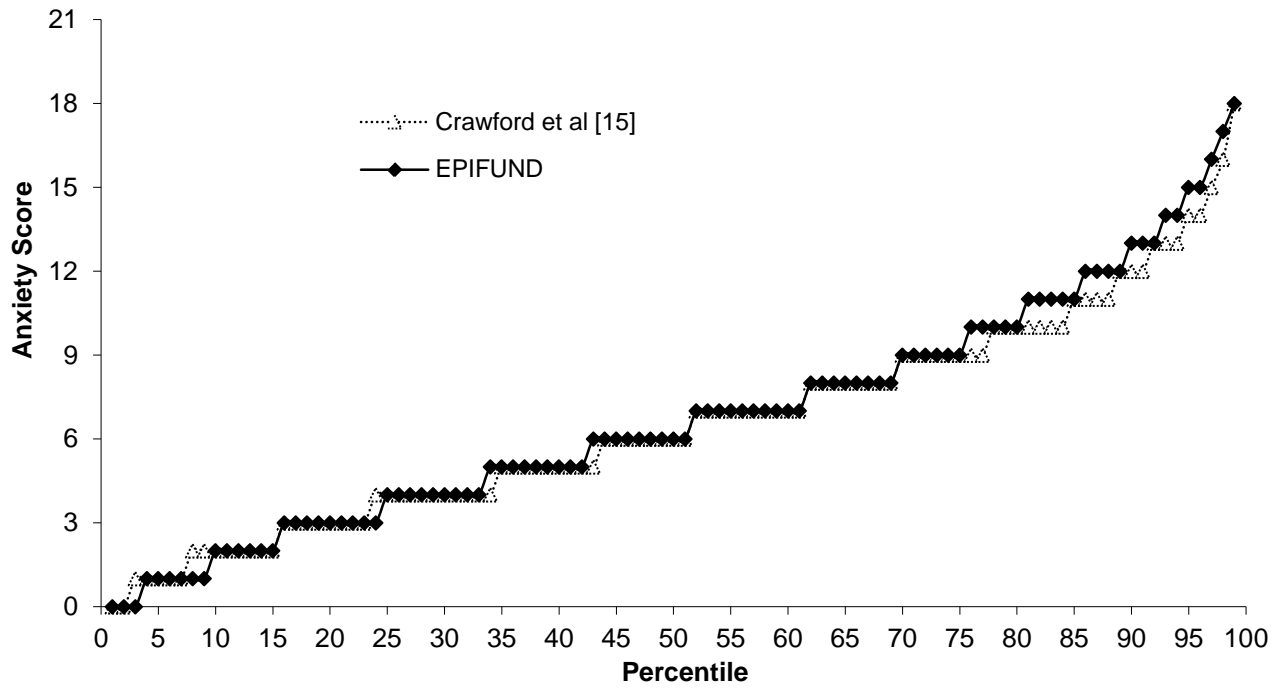
Figure Legends

Fig 1 Anxiety percentile scores generated from the EpiFunD study compared with those generated from the study providing the currently recommended normative data from the UK [15]. These are presented for females (a) and males (b) separately

Fig 2 Depression percentile scores generated from the EpiFunD study compared with those generated from the study providing the currently recommended normative data from the UK [15]. These are presented for females (a) and males (b) separately

Figure 1: Comparison of percentiles (anxiety)

(a): Females



(b): Males

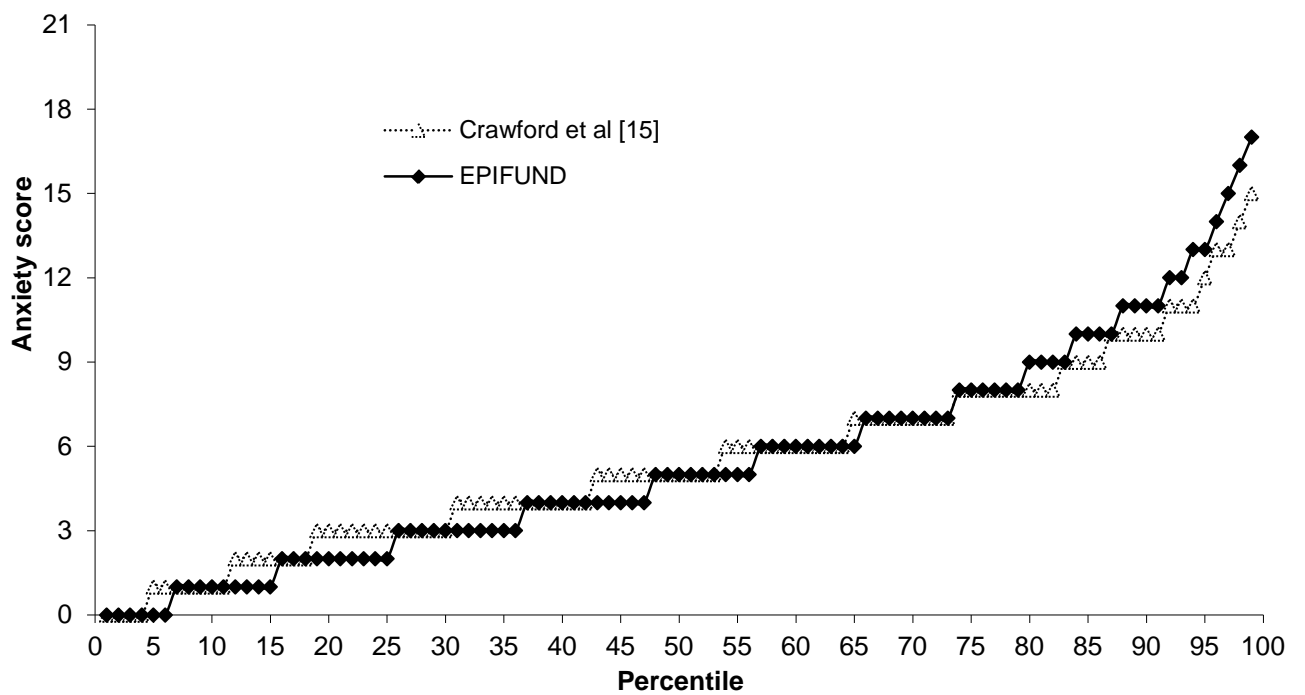
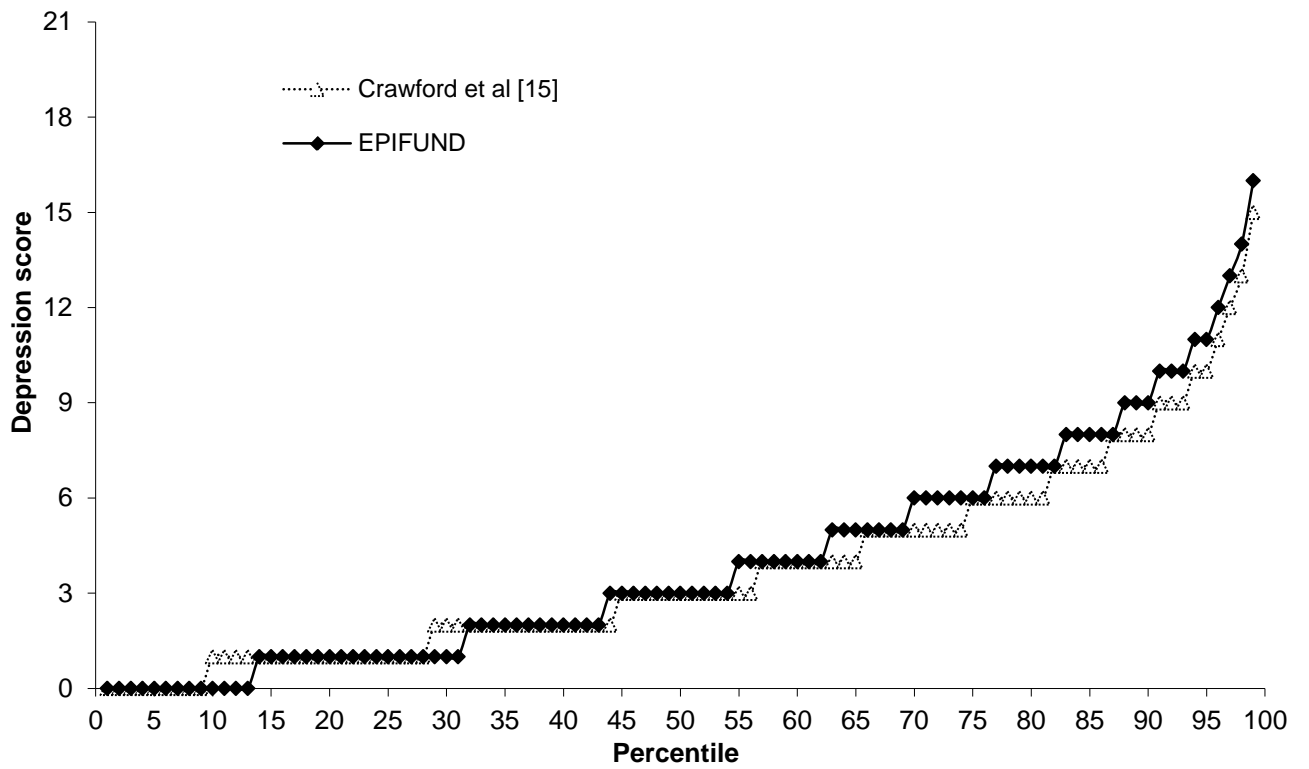


Figure 2: Comparison of percentiles (depression)

(a): Females



(b): Males

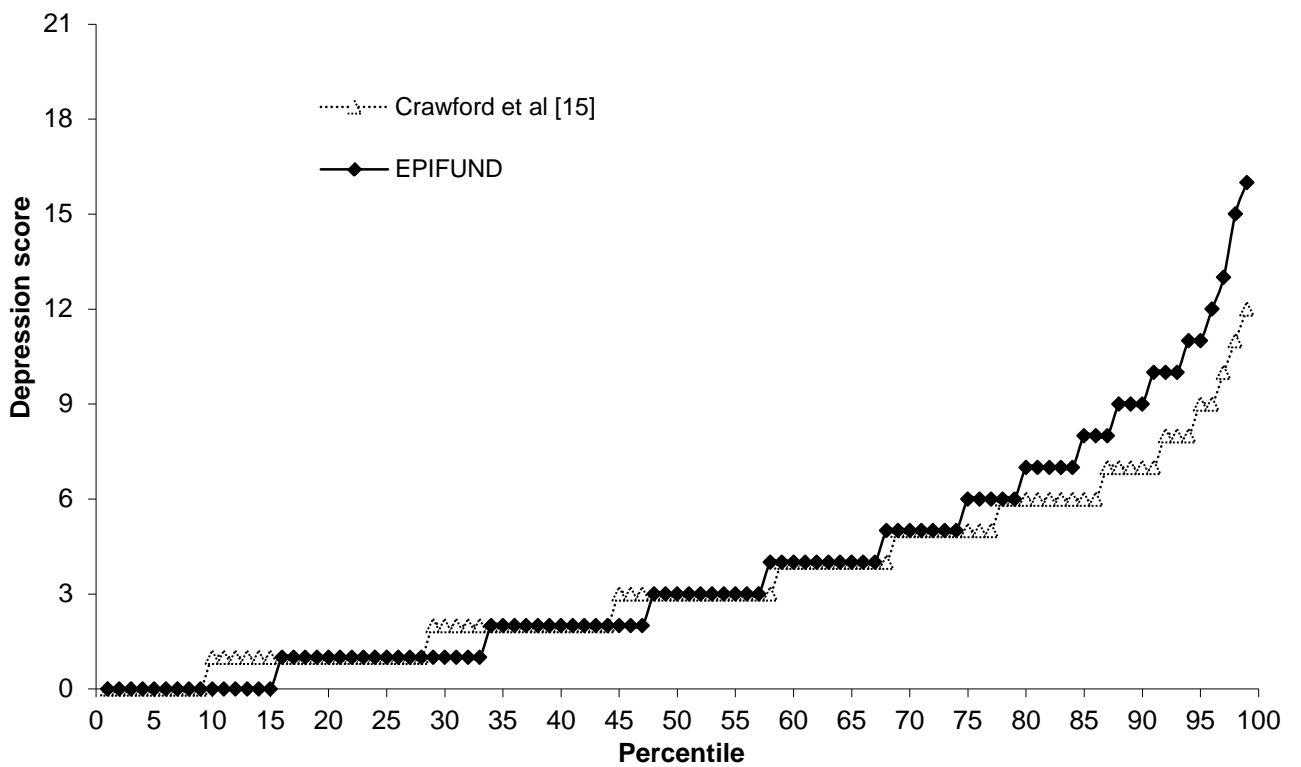


Table 1: Demographics of sample

Demographics	Anxiety (n = 6189)	Depression (n = 6198)	Anxiety and/or Depression (n = 6232)
Gender			
Female	3491 (56.4)	3503 (56.5)	3519 (56.5)
Male	2698 (43.6)	2695 (43.5)	2713 (43.5)
Age, Mean (SD)	45.9 (11.0)	45.9 (11.0)	45.9 (11.0)
Primary care practice			
Area A (least affluent)	1342 (21.7)	1345 (21.7)	1351 (21.7)
Area B (moderately affluent)	1746 (28.2)	1745 (28.1)	1760 (28.2)
Area C (most affluent)	3096 (50.0)	3103 (50.1)	3116 (50.0)
Unknown	5 (0.1)	5 (0.1)	5 (0.1)
Employment Status			
Working full time	3269 (52.8)	3268 (52.7)	3282 (52.7)
Working part time	1023 (16.5)	1024 (16.5)	1029 (16.5)
Working full time in the home	408 (6.6)	407 (6.6)	409 (6.6)
Not working because of ill health/disability	560 (9.1)	568 (9.2)	571 (9.2)
Unemployed but seeking work	120 (1.9)	117 (1.9)	120 (1.9)
Student	38 (0.6)	38 (0.6)	38 (0.6)
Semi-retired	112 (1.8)	114 (1.8)	114 (1.8)
Retired	511 (8.3)	519 (8.4)	520 (8.3)
Unknown	148 (2.4)	143 (2.3)	149 (2.4)
Marital Status			
Single	910 (14.7)	908 (14.7)	918 (14.7)
Married	4397 (71.1)	4409 (71.1)	4424 (71.0)
Other ¹	830 (13.4)	831 (13.4)	838 (13.5)
Unknown	52 (0.8)	50 (0.8)	52 (0.8)

^{*}Data are presented as number (%) unless otherwise indicated

¹Other (separated, divorced and widowed)

Table 2: Anxiety scores by gender and age

Age (yrs)	N (%)	Median (IQR)	Percentage (95% CI)			Mean (SD)
			Normal (score 0-7)	Mild (score 8-10)	Moderate/Severe (score ≥ 11)	
Females						
25-65	3491	6 (4, 9)	61.5 (59.8-63.1)	19.5 (18.2-20.9)	19.0 (17.7-20.4)	6.78 (4.23)
25-29	303 (8.7)	7 (4, 10)	54.5 (48.7-60.2)	21.8 (17.3-26.9)	23.8 (19.1-29.0)	7.18 (4.47)
30-34	485 (13.9)	6 (4, 10)	59.8 (55.3-64.2)	20.0 (16.5-23.8)	20.2 (16.7-24.1)	6.96 (4.27)
35-39	491 (14.1)	6 (3, 9)	62.5 (58.1-66.8)	19.4 (15.9-23.1)	18.1 (14.8-21.8)	6.74 (4.27)
40-44	486 (13.9)	6 (4, 9)	61.7 (57.2-66.1)	18.1 (14.8-21.8)	20.2 (16.7-24.0)	6.88 (4.29)
45-49	451 (12.9)	6 (4, 10)	62.3 (57.7-66.8)	18.0 (14.5-21.8)	19.7 (16.2-23.7)	6.87 (4.19)
50-54	455 (13.0)	6 (4, 9)	61.3 (56.7-65.8)	20.0 (16.4-24.0)	18.7 (15.2-22.6)	6.78 (4.42)
55-59	428 (12.3)	6 (3, 9)	61.4 (56.7-66.1)	21.3 (17.5-25.4)	17.3 (13.8-21.2)	6.59 (4.15)
60-65	392 (11.2)	6 (3, 8)	66.6 (61.7-71.2)	18.4 (14.7-22.6)	15.0 (11.7-19.0)	6.26 (3.90)
Males						
25-65	2698	5 (2, 8)	73.6 (71.9-75.3)	13.9 (12.6-15.3)	12.5 (11.3-13.8)	5.51 (4.04)
25-29	174 (6.4)	5 (2, 8)	72.4 (65.1-78.9)	13.8 (9.0-19.8)	13.8 (9.0-19.8)	5.70 (4.47)
30-34	283 (10.5)	5 (2, 8)	71.7 (66.1-76.9)	12.7 (9.1-17.2)	15.6 (11.5-20.3)	5.65 (4.05)
35-39	358 (13.3)	5 (3, 8)	74.0 (69.2-78.5)	14.0 (10.5-18.0)	12.0 (8.8-15.8)	5.59 (3.92)
40-44	371 (13.8)	5 (3, 8)	70.4 (65.4-75.0)	15.6 (12.1-19.7)	14.0 (10.6-18.0)	6.04 (4.12)
45-49	401 (14.9)	5 (3, 8)	71.3 (66.6-75.7)	14.2 (10.9-18.0)	14.5 (11.2-18.3)	5.85 (4.21)
50-54	384 (14.2)	5 (2, 8)	71.6 (66.8-76.1)	14.1 (10.7-17.9)	14.3 (11.0-18.2)	5.59 (4.15)
55-59	367 (13.6)	4 (2, 7)	77.7 (73.0-81.8)	13.1 (9.8-17.0)	9.3 (6.5-12.7)	4.90 (3.80)
60-65	360 (13.3)	4 (2, 7)	79.2 (74.6-83.2)	13.3 (10.0-17.3)	7.5 (5.0-10.7)	4.85 (3.63)

Table 3: Depression scores by gender and age

Age (yrs)	N (%)	Median (IQR)	Percentage (95% CI)			Mean (SD)
			Normal (score 0-7)	Mild (score 8-10)	Moderate/Severe (score ≥11)	
Females						
25-65	3503	3 (1, 6)	82.8 (81.5-84.1)	10.3 (9.3-11.3)	6.9 (6.1-7.8)	4.12 (3.78)
25-29	307 (8.8)	3 (1, 6)	83.1 (78.4-87.1)	10.4 (7.2-14.4)	6.5 (4.0-9.9)	3.86 (3.78)
30-34	483 (13.8)	3 (1, 6)	84.5 (80.9-87.6)	9.5 (7.1-12.5)	6.0 (4.1-8.5)	3.92 (3.70)
35-39	490 (14.0)	3 (1, 6)	80.8 (77.0-84.2)	13.1 (10.2-16.4)	6.1 (4.2-8.6)	4.16 (3.83)
40-44	489 (14.0)	3 (1, 7)	80.8 (77.0-84.2)	10.8 (8.2-13.9)	8.4 (6.1-11.2)	4.21 (4.02)
45-49	452 (12.9)	3 (1, 6)	82.1 (78.2-85.5)	10.6 (7.9-13.8)	7.3 (5.1-10.1)	4.28 (3.98)
50-54	455 (13.0)	3 (1, 6)	81.2 (78.1-85.4)	9.9 (7.3-13.0)	8.1 (5.8-11.0)	4.27 (3.91)
55-59	428 (12.2)	3 (1, 6)	85.0 (81.3-88.3)	7.5 (5.2-10.4)	7.5 (5.2-10.4)	4.05 (3.61)
60-65	399 (11.4)	3 (1, 6)	85.0 (81.1-88.3)	10.0 (7.3-13.4)	5.0 (3.1-7.6)	4.07 (3.30)
Males						
25-65	2695	3 (1, 6)	84.6 (83.1-85.9)	8.5 (7.5-9.6)	6.9 (6.0-8.0)	3.83 (3.74)
25-29	173 (6.4)	2 (1, 4)	89.0 (83.4-93.3)	6.4 (3.2-11.1)	4.6 (2.0-8.9)	3.04 (3.62)
30-34	285 (10.6)	2 (1, 5)	88.1 (83.7-91.6)	7.0 (4.3-10.6)	4.9 (2.7-8.1)	3.42 (3.38)
35-39	359 (13.3)	3 (1, 5)	89.1 (85.4-92.2)	5.9 (3.7-8.8)	5.0 (3.0-7.8)	3.54 (3.41)
40-44	368 (13.7)	3 (1, 6)	82.9 (78.6-86.6)	8.4 (5.8-11.7)	8.7 (6.0-12.1)	4.04 (3.96)
45-49	402 (14.9)	3 (1, 6)	82.3 (78.3-85.9)	9.7 (7.0-13.0)	8.0 (5.5-11.1)	4.05 (4.02)
50-54	381 (14.1)	3 (1, 6)	80.6 (76.2-84.4)	10.5 (7.6-14.0)	8.9 (6.3-12.2)	4.33 (4.09)
55-59	363 (13.5)	3 (1, 5)	84.6 (80.4-88.1)	8.8 (6.1-12.2)	6.6 (4.3-9.7)	3.76 (3.57)
60-65	364 (13.5)	3 (1, 6)	83.5 (79.3-87.2)	9.6 (6.8-13.1)	6.9 (4.5-10.0)	3.93 (3.56)