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The impact of long term medical conditions on the outcomes of psychological therapy for depression and anxiety

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Abstract

[word count: 150]

***Background*:** Long term conditions (LTC) often coexist with depression and anxiety.

***Aims*:** To assess the effectiveness of stepped care psychological therapies for patients with LTC.

***Method*:** Data from 28498 patients were analysed using regression to model depression (PHQ-9) and anxiety (GAD-7) outcomes. Post-treatment symptoms and effect sizes (*d*) were estimated for cases with and without LTC, controlling for covariates. The likelihood of access and response to intensive psychological interventions was also examined.

***Results*:** Higher post-treatment symptoms were predicted for patients with musculoskeletal problems (*d* = .22 to .27), COPD (*d* = .26 to .33), diabetes (*d* = .05 to .13) and psychotic disorders (*d* = .50 to .58). Most LTC were associated with greater odds of accessing high intensity therapies (HIT), yet HIT cases continued to have higher average post-treatment symptoms.

***Conclusions*:** Some LTC are associated with greater intensity of care and poorer outcomes after therapy.

***Declaration of Interest*:** None.

Key words: Long term conditions, depression, anxiety, stepped care, IAPT

Long term conditions (LTC) are highly prevalent in the general population affecting approximately 20% of people[1] above the age of 16 and 58% of people over the age of 60.[2] Among the more prevalent LTC in the general population are hypertension, chronic pain, gastrointestinal disorders, asthma, arthritis, diabetes, heart disease and chronic obstructive pulmonary disease.[1,3] Multi-morbidity is common[3] and these LTC carry a huge financial cost to health services, accounting for approximately 70% of total health and social care expenditure in public healthcare systems like the UK National Health Service.[2] This highlights the need to treat both LTC and mental health problems concurrently. Although access to psychological care has been recommended as part of integrated care for LTC sufferers,[4] it is possible that the effect of psychological interventions for mental health problems may be attenuated by LTC. For example, Dickens and collaborators[5] reviewed the efficacy of psychological interventions for depression in patients with coronary heart disease and concluded that clinical trials show mixed evidence with small effect sizes favouring Cognitive Behavioural Therapy (CBT) as the treatment of choice for this population. Similar conclusions were reached in a systematic review of psychological interventions for persistent pain, which indicates modest effects for CBT in depression and anxiety symptom reductions.[6] Clinical trials reviewed in these meta-analyses often include participants with highly disabling LTC treated in specialist services or hospital settings, and therefore it is unclear if these findings are reflective of outcomes from routinely delivered therapy in primary care settings, where the majority of LTC patients are treated. The objective of this study was to investigate the clinical effectiveness of primary care psychological interventions for depression and anxiety in a large naturalistic sample, comparing outcomes between patients with and without LTC.

Method

Setting and interventions

Retrospective clinical case records for a cohort of psychological therapy patients were analysed. The data was gathered as part of routine clinical care across a psychological therapy service in the north of England which was linked to the national *Improving Access to Psychological Therapies* (IAPT) programme.[7] The study was conducted as a service evaluation using fully de-identified data, and therefore did not require ethical approval. Patients provided informed consent for their anonymous data to be used for audit, evaluation and research purposes. Patients accessing the service presented with depression and anxiety related problems and received evidence-based interventions organised in a stepped care model.[8] The majority accessed brief (<8 sessions) low intensity guided self-help (GSH) interventions based on principles of cognitive behavioural therapy (CBT). Those with enduring symptoms after GSH and those with more severe conditions had access to high intensity (up to 20 sessions) therapies including CBT, interpersonal psychotherapy, counselling for depression and EMDR for post-traumatic stress.

Measures and data sources

Consistent with the national IAPT programme, patients in the sample were asked to self-complete three standard outcome measures to monitor progress on a weekly basis. The PHQ-9 is a nine-item measure of major depression symptoms.[9] Each item is rated on 4 ordinal response options (0="Not at all"; 3="Nearly every day"), resulting in a depression severity score

between 0-27. A cut-off ≥ 10 is used to detect clinically significant depression symptoms. The GAD-7 is a seven-item measure of anxiety symptoms; it is also rated using 4 ordinal response options (0="Not at all"; 3="Nearly every day"), resulting in an anxiety severity score between 0-21.[10] A cut-off score ≥8 is recommended to identify the likely presence of a diagnosable anxiety disorder. The Work and Social Adjustment Scale (WSAS) is a measure of functioning across five domains: work, home management, social leisure activities, private leisure activities, and family and relationships.[11] Each item is rated between 0 (no impairment) and 8 (very severe impairment), with a total severity score between 0 – 40.

De-identified clinical assessment records were also collected for participants, including demographic (age, gender, ethnicity, employment, socioeconomic deprivation) and clinical information (primary diagnosis, baseline severity, use of psychotropic medication; number of treatment contacts; number of referrals into the service for each patient over a 5 year period, pre- and post-treatment outcome measures described above). Self-reported LTC were gathered using a standardised checklist of chronic illnesses at the time of initial assessment.[12] This checklist prompts clinicians to gather information about 15 specific conditions (see Table 2) including severe (psychotic) mental health problems and an option to note “other” unspecified conditions. Socioeconomic deprivation was assessed by matching participants’ home postcodes to the English Index of Multiple Deprivation[13] and categorising cases into quintile levels of deprivation (categorical variable named IMD).

Sample characteristics

A total of 32734 case records for gathered for patients who accessed psychological treatment (at least one session) over a period of 5 years between 2010 and 2015. Of these, 2676 (8.2%) were excluded because they had no recorded information about LTC, and a further 1560 (4.8%) were excluded because no baseline and end scores were available for at least one of the outcome measures (PHQ-9 or GAD-7). This resulted in a sample of 28498 case records that were available for analysis.

The mean age in the sample was 38.27 (SD = 13.94; range = 16 to 92); 64.6% were females; 85.5% were of a White British background; and 36.6% were unemployed. Primary presenting problems recorded in clinical assessments are presented in Table 1; the most common were recurrent depression (38.5%), mixed anxiety & depression (26.0%) and generalised anxiety disorder (12.1%). Self-reported LTC are listed in order of prevalence in Table 2. Overall, 23.2% of patients reported having at least 1 LTC; the most common were asthma (6.8%), musculoskeletal problems (chronic pain; 1.8%) and hypertension (1.7%). Approximately 68.0% of patients in this sample only received low intensity guided self-help interventions, and 32.0% accessed high intensity therapies.

[Tables 1 and 2]

Statistical analysis

The goals of the analysis were to predict depression (PHQ-9) and anxiety (GAD-7) symptom severity at the end of treatment, controlling for demographic and clinical characteristics described above, and to compare these outcomes between cases with and without LTC. Given the typically high correlations between the PHQ-9 and GAD-7 scales,[14] we applied a seemingly unrelated regression (SUR) model.[15] SUR models estimate several equations simultaneously when the error terms of these equations are potentially correlated, which is a likely scenario for the prediction equations from PHQ-9 and GAD-7 scores. These models have been applied previously to model correlated dimensions of patient reported outcomes and have been shown to increase the efficiency of estimates in such situations.[16] As a sensitivity analysis, we repeated the SUR analysis using a dichotomous variable denoting the presence or absence of a LTC, instead of entering dummy variables for the different LTC categories.

In order to compare outcomes between patients with and without LTC, we estimated effect sizes (Cohen's *d*) based on comparing post-treatment outcomes between specific LTC groups versus the 'No LTC' category and the Root Mean Square Error of the respective part (e.g. PHQ-9 or GAD-7) of the SUR model.

As a sensitivity analysis, we assessed differential item functioning (DIF) to verify if responses to the PHQ-9 and GAD-7 measures are comparable across LTC groups, or if differences in outcome scores could be biased in favour or against certain LTCs. Specifically, we aimed to assess if responses to individual PHQ-9 or GAD-7 items corresponded to the same

psychopathology severity levels across LTC groups. To achieve this, we applied logistic ordinal regressions standardising on latent variable estimates of depression and anxiety using a Generalised Partial Credit Model (uniform and non-uniform DIF), as described by Crane et al.[17] We evaluated differences in Pseudo-R^2 values between regression models to assess whether the LTC categories explained a relevant amount of variance in final PHQ-9 and GAD-7 scores.

Considering the stepped care context in which psychological interventions were provided to this sample, we carried out secondary analyses to investigate if LTC patients may differ in their probability to receive and respond to high intensity therapy, which would be plausible given their general higher level of distress and functional impairment. To test this hypothesis, we used the same predictors described above (in the SUR model) in a logistic regression model aiming to predict the likelihood of concluding a treatment episode at the higher step of care (high intensity therapy versus low intensity care as a reference category). In this analysis n = 29 (0.1% of total) case records were excluded because of inputting errors in the clinical database, which did not enable us to identify the assignment of cases to low or high intensity steps of care. Furthermore, we repeated the SUR analysis separately analysing cases that finished their treatment episode after accessing low (n = 18902) or high (n = 8884) intensity interventions.

Since the amount of missing data was only minimal (n_{miss} = 683, 2.4% of available cases), no additional imputation analyses were undertaken. As expected, most missing data points were for the outcome measures (PHQ-9 and GAD-7) and 390 cases did not have valid postcodes documented in

clinical records, so IMD could not be derived. Furthermore, IMD data could not be imputed, since it is a geographical rather than an individual characteristic.

Results

Seemingly unrelated regression equations (SUR) modelling

As expected, the equations for PHQ-9 and GAD-7 outcomes were highly correlated. The correlation between the error terms of the two equations was large (r = .82) and statistically significant (Breusch-Pagan test; x^2 = 18704.17, p < .001). The SUR model explained a moderate amount of variance in post-treatment outcomes (PHQ-9 = 34%; GAD-7 = 29%). Table 3 presents the SUR model results in the full sample, which are interpreted below. In what follows, we refer to combined depression (PHQ-9) and anxiety (GAD-7) symptoms at the time of the last attended treatment session as 'post-treatment distress levels'.

[Table 3]

Analysis of demographic variables

Age was significantly correlated with both outcomes, though the association was weak, equivalent to a reduction of 0.01 score points per year increase. Gender did not correlate with either measure. In contrast, unemployment was associated with higher average post-treatment distress; with an increase of +0.68 points for PHQ-9 and +0.54 points for GAD-7. Patients from South

Asian backgrounds, dual heritage and other ethnicities also had higher average post-treatment distress by comparison to patients from white British backgrounds. The IMD quintiles also show significant associations in the expected direction: Patients living in more socioeconomically deprived areas (as defined by their home postcode) tended to have greater symptom severity at the end of treatment, and there was an increasing trend in mean post-treatment scores for each quintile of deprivation.

Analysis of treatment-related variables

Differences attributable to taking medication were small and not statistically significant. The number of referrals for psychological treatment (over the last 5 years) was significantly associated with post-treatment outcomes. Each additional referral for care predicted an increase of +0.59 points for PHQ-9 and +0.55 for GAD7. Since up to 11 referrals were observed in the dataset, this could account for substantially greater post-treatment symptom severity for patients with multiple treatment episodes. A greater number of treatment contacts (in the index treatment episode) was associated with lower average post-treatment distress; decreasing this by -0.25 PHQ-9 points per contact attended (-0.22 for GAD7).

Some differences between diagnostic categories were observed. A patient with a diagnosis of depression (the reference category) will finish therapy with a predicted PHQ-9 score of 9.69 (*SE* = .08; marginal mean) and GAD-7 = 8.45 (*SE* = .07). Some diagnoses were associated with higher post-treatment distress by comparison to the above reference scores; these were obsessive compulsive disorder (GAD-7), post-traumatic stress disorder (PHQ-9 and GAD-7), and eating disorders (PHQ-9). Diagnoses associated with

lower predicted distress levels compared to depression were generalised anxiety disorder (PHQ-9), panic disorder (PHQ-9) and somatoform disorders (PHQ-9).

As expected, baseline severity (PHQ-9, GAD-7) and functional impairment (WSAS) measures were significantly correlated with post-treatment outcomes, such that more severely impaired cases were expected to have higher post-treatment distress severity.

Analysis of LTC data

After controlling for all of the above demographic and clinically relevant variables, five LTC categories were associated with higher post-treatment distress levels: chronic musculoskeletal problems, chronic obstructive pulmonary disease, severe mental health problems, diabetes, and "other" non-specified conditions. Figure 1 presents predicted marginal post-treatment outcome scores and Sidak-adjusted 95% confidence intervals; this shows that estimated post-treatment means differed substantially across the categories of LTC. The figure also presents the estimated treatment effect sizes corresponding to each LTC category, by comparison to the reference group of cases without any self-reported LTC (and in relation to non-explained variance in the regression model; $RMSE_{PHQ\text{-}9} = 5.82$; $RMSE_{GAD\text{-}7} = 5.14$). The effect sizes for those 5 LTC categories associated with poorer outcomes range from small (around $d = .20$) to medium (around 0.50; according to Cohen[18]).

[Figure 1]

Sensitivity and secondary analyses

Our sensitivity analyses found no evidence of differential item functioning (DIF) on PHQ-9 or GAD-7 across LTC groups. The maximal difference in Pseudo-R^2 values across regression models was 0.001, which is far smaller than the recommended cut-off of .035,[17] indicating that only very small amounts of variance in item responses were related to specific LTCs (details available in data supplement, tables DS1-DS8).

The SUR model including a dichotomous variable (LTC vs. no LTC) resulted in an adjusted mean difference of +0.57 (*SE* = .09, p < .001) for the PHQ-9 and +0.42 for GAD-7 (*SE* = .08, p < .001), which speaks for a general disadvantage of this LTC population after controlling for potentially confounding variables. However, this effect is rather small (ES_{PHQ} = .10 and ES_{GAD} = .08; coefficients standardised on regression root-mean-square error) and therefore modelling post-treatment outcomes for each specific LTC is more informative. When we repeated the SUR analysis in the separate samples of cases that finished treatment after low or high intensity interventions, the results (details available in data supplement, table DS9) were largely consistent with the main SUR model shown in Table 3. The only differences were found for COPD and diabetes cases. COPD continued to be associated with higher post-treatment PHQ-9 (B = 3.81, $p < .001$) and GAD-7 (B = 2.34, $p < .01$) scores after high intensity interventions, but not after low intensity interventions (PHQ-9: B = 0.90, $p > .05$; GAD-7: B = 0.75, $p > .05$). Diabetes continued to be associated with higher post-treatment PHQ-9 (B = 1.30, $p < .01$) but not with GAD-7 (B = 0.50, $p > .05$) scores after high intensity interventions; no such associations were found for cases that only

accessed low intensity interventions (PHQ-9: B = 0.43, $p > .05$; GAD-7: B = 0.00, $p > .05$).

Table 4 shows the results of the logistic regression model predicting the likelihood of receiving high intensity therapy. As expected, patients with most LTC had a significantly higher probability of receiving high intensity interventions (odds ratios = 1.23 to 1.66; all $p < .05$). The only exceptions to this were found for patients with cardiovascular conditions, epilepsy and severe (psychotic) mental disorders, who were no more likely to receive high intensity therapy by comparison to those without any self-reported LTC.

[Table 4]

Discussion

The overall goal of this study was to compare the effects of routinely delivered psychological care for patients with and without self-reported LTC. We found that patients with certain LTC tend to finish psychological treatment with greater depression and anxiety severity. By comparison to patients without LTC, this trend was statistically significant for musculoskeletal problems (effect sizes $d = .22$ to .27), chronic obstructive pulmonary disease ($d = .26$ to .33), diabetes ($d = .05$ to .13), severe mental health problems ($d = .50$ to .58) and "other" non-specified conditions ($d = .10$ to .11). These findings converge with some observations of small to moderate effect sizes reported by meta-analyses of psychological interventions.[6,19-21]

Furthermore, patients with most types of self-reported LTC (except cardiovascular conditions, epilepsy and severe mental disorders) were significantly more likely to receive more intensive and costly psychological interventions, consistent with their higher level of impairment and symptom severity. Accessing high intensity therapy continued to be associated with higher average post-treatment distress in secondary analyses, indicating that LTC patients are not necessarily better off after high intensity (versus low intensity) care in this primary care setting. We noted that, in particular, severe mental health problems (such as psychotic disorders) tended to be strongly associated with poorer outcomes, though the prevalence of such conditions was very small (0.5%) given the service's remit to offer treatment for common mental health problems. This evidence may indicate that the intensity and type of interventions offered in this primary care setting are clearly inadequate to improve psychological distress symptoms in cases with a history of severe and enduring (i.e., psychotic) mental disorders. It is also plausible that those with severe mental disorders were identified as such during the early phases of low intensity interventions and appropriately referred onwards to secondary care / psychiatric services; hence explaining why these cases were not more likely to access high intensity therapies in this primary care setting.

A range of other demographic and clinical factors were also associated with post-treatment outcomes. Baseline severity and impairment measures, employment status, socioeconomic deprivation and age have been shown to predict outcomes in comparable clinical samples and settings.[22-24] In addition, the present results also indicate that patients from certain ethnic backgrounds (South Asian, dual heritage) and diagnostic groups (obsessive

compulsive disorder, post-traumatic stress disorder and eating disorders) may be at increased risk of poor treatment outcomes.

The overall prevalence of self-reported LTC in this cohort of psychological treatment patients (23.2%) was comparable to general adult population estimates (20%) from England.[1] Asthma was the most prevalent (identifiable) LTC (around 6% of patients); which may reflect the common co-existence of this condition with anxiety related problems. However, a comparison of specific categories reveals a disproportionately small representation of certain conditions such as hypertension (1.7% in our sample vs. 14.3% in the general population), musculoskeletal problems (1.8% vs. 14.0%), diabetes (1.5% vs. 3.8%), heart failure (0.1% vs. 2.0%), and chronic obstructive pulmonary disease (0.5% vs. 1.8%). These discrepancies possibly indicate that patients with certain conditions are much less likely to access psychological care; for example the large discrepancy for hypertension indicates a ratio of 1:12. This discrepancy might in some cases be explained by the existence of specialist teams for LTC sufferers; for example the local area for this cohort of patients had 2 specialist musculoskeletal treatment services. However, it is possible that some patients with LTC commonly treated in primary care clinics may be inadequately screened or seldom referred for mental health treatment. Recent research indicates that this may be the case for some patients with coronary heart disease and diabetes.[25]

Strengths and limitations

This large (N = 28,498) naturalistic cohort was adequately powered to assess the predictive value of multiple demographic and clinical variables, which

was optimally modelled using joint-prediction of correlated outcomes (PHQ-9, GAD-7). Our analyses additionally contained another layer of robustness tests. It is important to establish measurement invariance to have confidence that outcome questionnaires can be interpreted similarly across different patient groups.[26,27] Our sensitivity analyses found no evidence of differential item functioning in PHQ-9 or GAD-7, which indicates that results of these outcome measures have the same meaning across LTC and non-LTC groups in this sample. This finding supports the notion that post-treatment outcome differences between LTC groups are likely to represent actual differences in psychological distress, rather than measurement error or confounding of LTC symptoms with mental health symptoms.

Some limitations to note include the reliance on self-reported long term conditions, as is common in large cohort and epidemiological studies.[1,28] In particular, we did not have more specific information about the types of LTC of patients who endorsed the 'other' category in assessment records. Presenting problem categories for mental health issues were also likely to be error prone, since these were ascertained using brief screening measures[12] rather than structured diagnostic interviews. Future studies that gather LTC diagnoses recorded in medical records and structured diagnostic interviews may render more precise outcome prediction estimates. A further caveat is that the data from this study, albeit large, came from a single site in the north of England. Future replication studies using data from similar stepped care services in other regions would enable us to assess the extent to which these findings are generalizable.

Implications for clinical practice

The impact of and need for integrated mental health services has often been discussed from a medical perspective, i.e. how psychological professionals could be brought into medical contexts.[29,30] Specialist medical knowledge about LTC is a key element of success and the integration of medical expertise within mental health services could also help to improve treatment outcomes in these settings.

Our observations raise questions about the effectiveness of routinely delivered stepped care psychological treatments for people with comorbid diabetes, chronic obstructive pulmonary disease and chronic pain. These results also mirror findings from research into health-related quality of life (QOL), where it is also found that certain LTC (e.g. chronic pain) and especially having multiple LTC can considerably undermine QOL and exacerbate psychological distress.[31] Such studies highlight the importance of multi-disciplinary care aiming to target multiple facets of wellbeing, adjustment and QOL. It may be particularly important to offer integrated multi-disciplinary care for people with specific conditions described above. For example, collaborative care interventions can enhance self-management of depression symptoms for patients with diabetes and coronary heart disease.[29] Overall, we conclude that standard stepped-care interventions are insufficient to support patients with multi-morbidity, especially if delivered in isolation from other healthcare specialists. Our observations concur with recent calls for closer integration of physical and mental healthcare.[32]

Healthcare economies and policy makers should systematically investigate the prevalence of LTC in mental health services. This information could be

crucial to design and deliver more integrated care for patients with LTC, but can also serve to understand how the demographic and clinical profile of local populations could have an impact on service outcomes. This aspect is still underexplored, especially when thinking about new benchmarking models and quality indicators within primary care psychological services.[33]

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All authors contributed to the design, writing, interpretation of results and approval of the final manuscript. JD led on writing the manuscript and JB led on data analysis.

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Table 1. Primary presenting problems recorded in clinical assessments

Description	N = 28,498	%
Recurrent depression	8,698	38.5
Mixed anxiety & depression	5,887	26.0
Generalised anxiety disorder	2,725	12.1
Depressive episode	1,160	5.1
Panic disorder	970	4.3
Social phobia	540	2.4
Obsessive compulsive disorder	643	2.8
Post-traumatic stress disorder	565	2.5
Specific phobia	290	1.3
Bereavement	201	0.9
Eating disorder	177	0.8
Agoraphobia	163	0.7
Somatoform disorder	149	0.7
Alcohol related mental or behavioural disorder	40	0.2
Bipolar affective disorder	22	0.1
Does not meet diagnostic criteria for a common mental disorder	379	1.7
Not specified in records	5,889	20.7

Table 2. Self-reported long term medical conditions (LTC)

Description	N = 28,498	%
None	21882	76.8
Other (unspecified)	2316	8.1
Asthma	1935	6.8
Chronic musculoskeletal	507	1.8
Hypertension	490	1.7
Non-insulin-dependent diabetes mellitus	327	1.1
Epilepsy	188	0.7
Chronic obstructive pulmonary disease	137	0.5
Coronary heart disease	137	0.5
Severe (psychotic) mental health problems	134	0.5
Insulin-dependent diabetes mellitus	111	0.4
Cancer	114	0.4
Stroke and transient ischaemic attack	76	0.3
Multiple sclerosis	49	0.2
Chronic kidney disease	41	0.1
Heart failure	38	0.1
Parkinson`s disease	16	0.1

Table 3. Estimated coefficients for the SUR model jointly predicting post-treatment depression (PHQ-9) and anxiety (GAD-7) severity

	PHQ-9		GAD-7	
Variable	**B**	**SE**	**B**	**SE**
PHQ-9 (baseline severity)	0.31***	0.00		
GAD-7 (baseline severity)			0.33***	0.00
WSAS (baseline severity)	0.17***	0.00	0.13***	0.00
Age (years)	-0.01**	0.00	-0.01***	0.00
Female	-0.07	0.07	0.02	0.07
Unemployed	0.68***	0.07	0.54***	0.07
Ethnicity: Dual heritage[a]	0.49*	0.23	0.56**	0.20
Ethnicity: South Asian[a]	1.29***	0.18	1.13***	0.16
Ethnicity: Black British, African or Caribbean[a]	-0.37	0.25	-0.38	0.22
Ethnicity: Other[a]	0.53***	0.15	0.45***	0.13
2nd IMD quintile[b]	-0.77***	0.11	-0.63***	0.10
3rd IMD quintile[b]	-1.11***	0.11	-0.85***	0.09
4th IMD quintile[b]	-1.36***	0.11	-1.03***	0.10
5th IMD quintile[b]	-1.75***	0.12	-1.33***	0.10
Medication	-0.30	0.18	-0.20	0.16
Number of referrals into service	0.59***	0.03	0.55***	0.03
Treatment contacts attended	-0.25***	0.01	-0.22***	0.01
Recurrent depression[c]	0.36	0.19	0.29	0.17
Mixed anxiety & depression[c]	0.16	0.10	0.22*	0.09
Generalised anxiety disorder[c]	-0.56***	0.14	-0.14	0.12
Social phobia[c]	-0.30	0.27	-0.24	0.24
Panic disorder[c]	-0.43*	0.20	-0.12	0.18
Agoraphobia[c]	-0.09	0.46	0.15	0.41
Specific phobia[c]	-0.23	0.36	0.10	0.31
Obsessive-compulsive disorder[c]	-0.25	0.25	0.69**	0.22
Post-traumatic stress disorder[c]	0.55*	0.26	1.01***	0.23
Bereavement[c]	0.76	0.42	0.69	0.38
Eating disorder[c]	1.64***	0.45	0.71	0.40
Somatoform disorder[c]	-1.18*	0.49	-0.66	0.43
Does not meet CMD criteria[c]	0.38	0.31	0.18	0.27
Other diagnosis[c]	0.06	0.11	0.16	0.10
Asthma[d]	0.17	0.14	0.21	0.12
Cancer[d]	0.48	0.55	0.03	0.48
Chronic Musculokeletal[d]	1.56***	0.26	1.15***	0.23
COPD[d]	1.92***	0.51	1.35**	0.45
Cardiovascular[d]	0.10	0.22	-0.05	0.20
Diabetes[d]	0.77**	0.29	0.24	0.25
Epilepsy[d]	-0.07	0.43	0.04	0.38
Severe Mental Health Problems[d]	3.36***	0.51	2.58***	0.45
Other LTC[d]	0.67***	0.13	0.52***	0.11
Constant	3.74***	0.27	3.15***	0.24
Observations	27,815		27,815	
R-squared	0.34		0.29	

Notes: SUR = seemingly unrelated regression; B = regression coefficient; SE = standard error; PHQ-9 = depression measure; GAD-7 = anxiety measure; WSAS = work & social adjustment scale; IMD = index of multiple deprivation (quintile groups); CMD = common mental disorder; LTC = long term medical condition; COPD = chronic obstructive pulmonary disease; [a] reference category: White British; [b] reference category: first IMD quintile; [c] reference category: depressive episode; [d] reference category: no self-reported long term condition; * $p < .05$; ** $p < .01$; *** $p < .001$

Table 4. Probability of accessing high intensity therapy for patients with LTC

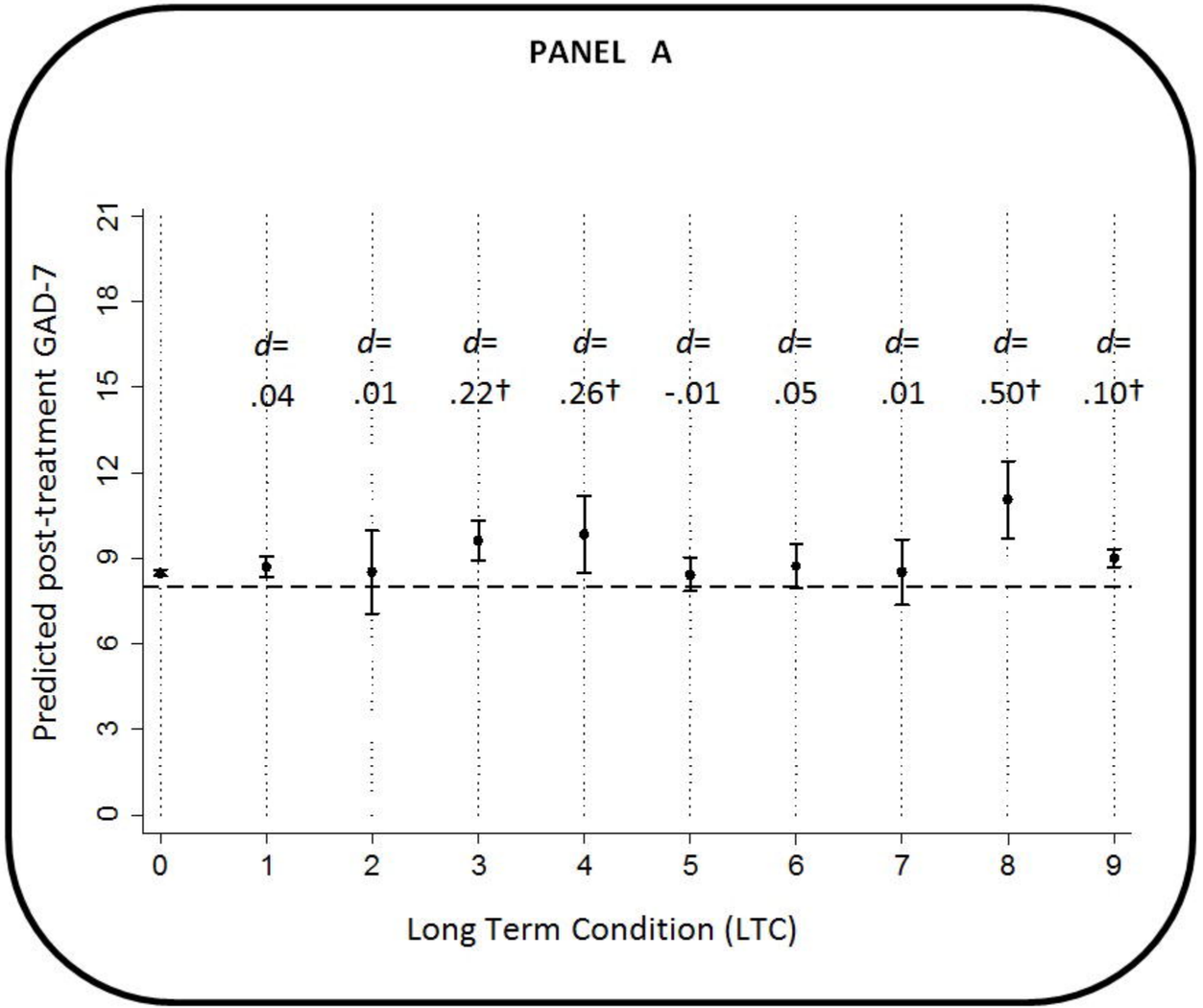
Long term condition (LTC)	Odds Ratio	95% Confidence intervals	
		Lower bound	Upper bound
Asthma	1.23**	1.09	1.39
Cancer	1.66*	1.03	2.65
Chronic Musculoskeletal	1.47**	1.17	1.84
COPD	1.60*	1.04	2.47
Cardiovascular	1.15	0.94	1.40
Diabetes	1.39*	1.07	1.79
Epilepsy	0.99	0.68	1.44
Severe (psychotic) mental health problems	1.00	0.64	1.57
Other non-specified LTC	1.30***	1.17	1.46

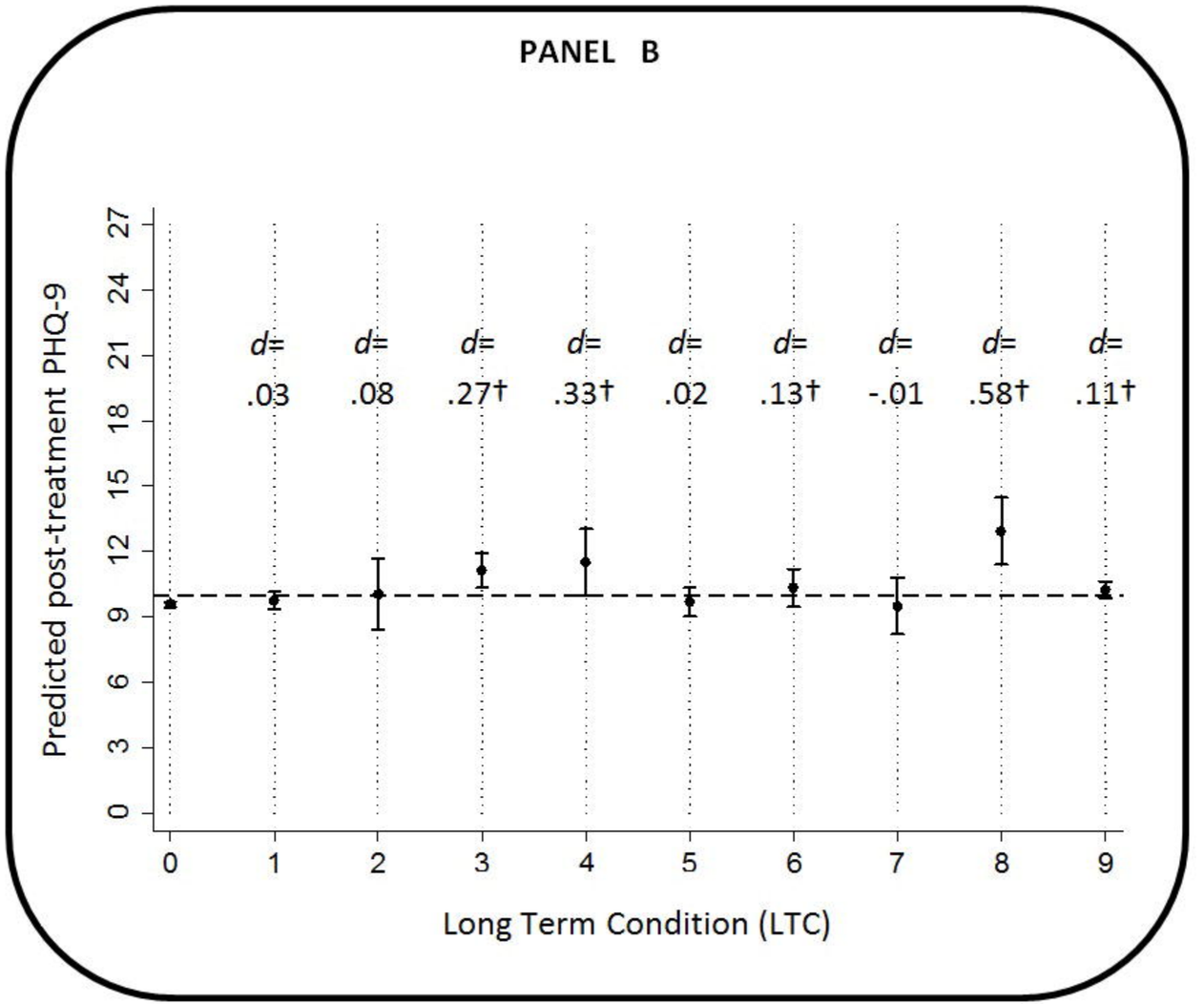
* p <.05; ** p <.01; *** p <.001; all coefficients controlled for demographic and treatment-related variables as for the main analysis (see table 3)

Figure 1. Predicted post-treatment anxiety (GAD-7) and depression (PHQ-9) scores across LTC groups

[Figure attached separately]

Notes: Marginal post-treatment scores derived from seemingly unrelated regression model (table 3) jointly predicting GAD-7 (panel A) and PHQ-9 (panel B) for a patient starting with mean Age (38.38), PHQ-9 (15.17), and GAD-7 (13.38) scores. The y-axes of both plots present the potential range in scores and the effect sizes (Cohen's *d*) are based on comparisons with the "No LTC" category and the Root Mean Square Error of the respective part of the regression model. † Coefficient significant (see table 1). 0 = no LTC; 1 = Asthma; 2 = Cancer; 3 = Chronic Musculoskeletal; 4 = COPD; 5 = Cardiovascular; 6 = Diabetes; 7 = Epilepsy; 8 = Severe (psychotic) mental health problems; 9 = other non-specified LTC.


PANEL A
Predicted post-treatment GAD-7
0
3
6
9
12
15
18
21
d= .04
d= .01
d= .22†
d= .26†
d= -.01
d= .05
d= .01
d= .50†
d= .10†
0
1
2
3
4
5
6
7
8
9
Long Term Condition (LTC)


PANEL B
Predicted post-treatment PHQ-9
0
3
6
9
12
15
18
21
24
27
d= .03
d= .08
d= .27†
d= .33†
d= .02
d= .13†
d= -.01
d= .58†
d= .11†
0
1
2
3
4
5
6
7
8
9
Long Term Condition (LTC)