Care Quality Commission (CQC)

Technical details – patient survey information
2013 Community Mental Health Survey
August 2013

Contents

1. Introduction

This document outlines the methods used by the Care Quality Commission to score and analyse the results for the 2013 Community Mental Health Survey, as available on the Care Quality Commission website, and in the benchmark report for each trust.

The survey results are shown on the CQC website in a simplified way, identifying whether a trust performed 'better' or 'worse' or 'about the same' as the majority of other trusts for each question. An A-to-Z list of trust names is available at the link below, containing further links to the survey data for all NHS trusts that took part in the survey: **http://www.cqc.org.uk/public/reports-surveys-and-reviews/surveys/community-mental-health-survey-2013**

The CQC webpage also contains the national results for England, comparing against the results for the previous survey. A link to the benchmark report for each trust is also here, linking through to where these are held on the patient survey coordination centre website. Results displayed in the benchmark report for each trust are a graphical representation of the results displayed for the public on the CQC website (see further information section). These provide more detailed information for mental health providers who took part in the survey.

2. Selecting data for the reporting

Scores are assigned to responses to questions that are of an evaluative nature: in other words, those questions where results can be used to assess the performance of a trust (see Appendix A 'Scoring for the 2013 Community Mental Health Survey results' for more detail). Questions that are not presented in this way tend to be those included solely for 'filtering' respondents past any questions that may not be relevant to them (such as: 'In the last 12 months, have you taken any prescribed medication for your mental health condition?') or those used for descriptive or information purposes.

The scores for each question are grouped on the website according to the sections of the questionnaire as completed by respondents. For example, the Community Mental Health Survey includes sections on 'health and social care workers,' 'medications' and 'your care plan' amongst others. The average score for each trust, for each section, is also calculated and presented on the website.

Alongside both the question and the section scores on the website are one of three statements:

- Better (the trust is performing 'better' compared with most other trusts in the survey)
- About the same (the trust is performing 'about the same' as most other trusts in the survey)
- Worse (the trust is performing 'worse' compared with most other trusts in the survey)

3. The CQC organisation search tool

The organisation search tool was previously referred to as the Care Directory, and survey data has been displayed in it since 2007. It is intended for a public audience, and contains information from various areas within the Care Quality Commission's

functions. The presentation of the survey data was designed using feedback from people who use the data, so that as well as meeting their needs, it presents the groupings of the trust results in a simple and fair way, to show where we are more confident that a trust's score is 'better' or 'worse' than most other trusts.

The survey data can be found from the A to Z link available at:
http://www.cqc.org.uk/public/reports-surveys-and-reviews/surveys/community-mental-health-survey-2013

Or by searching for a trust from the CQC home page, then clicking on 'Patient survey information' on the right hand side.

4. Interpreting the data

4.1 Scoring

The questions are scored on a scale from 0 to 10. Details of the scoring for this survey are available in Appendix A at the end of this document.

The scores represent the extent to which the service user's experience could be improved. A score of 0 was assigned to all responses that reflect considerable scope for improvement, whereas a response that was assigned a score of 10 referred to the most positive possible reported service user experience. Where a number of options lay between the negative and positive responses, they were placed at equal intervals along the scale. Where options were provided that did not have any bearing on the trusts' performance in terms of service user experience, the responses were classified as "not applicable" and a score was not given. Where respondents stated they could not remember or did not know the answer to a question, a score was not assigned.

4.2 Standardisation

Results are based on 'standardised' data. We know that the views of a respondent can reflect not only their experience of NHS services, but can also relate to certain demographic characteristics, such as their age and sex. For example, older respondents tend to report more positive experiences than younger respondents, and women tend to report less positive experiences than do men. Because the mix of service users varies across trusts (for example, one trust may serve a considerably older population than another), this could potentially lead to the results for a trust appearing better or worse than they would if they had a slightly different profile of service users. To account for this we 'standardise' the data. Standardising data adjusts for these differences and enables the results for trusts to be compared more fairly than could be achieved using non-standardised data.

The Community Mental Health Survey is standardised by age and gender.

4.3 Expected range

The better / about the same / worse categories shown on the website are based on the 'expected' range that is calculated for each question for each trust. This is the range within which we would expect a particular trust to score if it performed about the same as most other trusts in the survey. The range takes into account the number of respondents from each trust as well as the scores for all other trusts, and

allows us to identify which scores we can confidently say are 'better' or 'worse' than the majority of other trusts (see Appendix B for more details). The red, green and orange sections in the benchmark report charts display the expected range for a score for a trust. The orange section is the ‘expected range’, the green section shows where a score would lie if it were better than expected, and the red section signifies worse than expected performance.

Analysing the survey information in such a way allows for fairer conclusions to be made in terms of each trust’s performance. This approach presents the findings in a way that takes account of all necessary factors, yet is presented in a simple manner. As the ‘expected range’ calculation takes into account the number of respondents at each trust who answer a question, it is not necessary to present confidence intervals around each score for the purposes of comparing across all trusts.

4.4 Comparing scores across trusts or across survey years

The expected range statistic is used to arrive at a judgement of a how a trust is performing compared with all other trusts that took part in the survey. However, if you want to use the scored data in another way, to compare scores (either as trend data for an individual trust or between different trusts) you will need to undertake an appropriate statistical test to ensure that any changes are ‘statistically significant’. ‘Statistically significant’ means that you can be very confident that any change between scores is real and not due to chance. The benchmark report for each trust includes a comparison to the 2012 survey scores and indicates whether the change is statistically significant. However, to compare back to earlier surveys (where possible) you would need to undertake a similar significance test.

4.5 Conclusions made on performance

It should be noted that the data only show performance relative to other trusts: there are no absolute thresholds for ‘good’ or ‘bad’ performance. Thus, a trust may score low relative to others on a certain question whilst still performing very well on the whole. This is particularly true on questions where the majority of trusts score very highly.

The better / worse categories are intended to help trusts identify areas of good or poor performance. However, when looking at scores within a trust over time, it is important to be aware that they are relative to the performance of other trusts. If, for example, a trust was ‘better’ for one question, then ‘about the same’ the following year, it may not indicate an actual decrease in the performance of the trust, but instead may be due to an improvement in many other trusts’ scores, leaving the trust to appear more ‘average’. Hence it is more accurate to look at actual changes in scores and to test for statistically significant differences.

It is also important to remember that there is no overall indicator or figure for ‘service user experience’, so it is not accurate to say that a trust is the ‘best in the country’ or ‘best in the region’ *overall*. Adding up the number of ‘better’ and ‘worse’ categories to find out which trust did better or worse overall is misleading. The number of questions on each topic in the survey varies, and often so does trusts performance across these. So if you counted across all of them, some topics will have more influence on the overall average than others, when in fact some might not be so important.

5. Further information

The full national results for the 2013 survey are on the CQC website, together with an A to Z list to view the results for each trust (alongside the technical document outlining the methodology and the scoring applied to each question):
www.cqc.org.uk/PatientSurveyMentalHealth2013

The results for the 2010, 2011 and 2012 community mental health surveys can be found on the NHS surveys website at:
www.nhssurveys.org/surveys/290

Full details of the methodology for the survey can be found at:
http://www.nhssurveys.org/surveys/675

More information on the programme of NHS patient surveys is available at:
www.cqc.org.uk/public/reports-surveys-and-reviews/surveys

More information on Quality and Risk Profiles (QRP) can be found at:
www.cqc.org.uk/organisations-we-regulate/registered-services/quality-and-risk-profiles-qrps

More information about CQC's consultation on changes to the way we inspect, regulate and monitor care services can be found here:
http://www.cqc.org.uk/public/sharing-your-experience/consultations/consultation-changes-way-we-inspect-regulate-and-monito

Appendix A: Scoring for the 2013 Community Mental Health Survey results

The following describes the scoring system applied to the evaluative questions in the survey. Taking question 22 as an example (Figure A1), it asks respondents whether they understand what is in their NHS care plan. The option of "No" was allocated a score of 0, as this suggests that the experience of the service user needs to be improved. A score of 10 was assigned to the option 'Yes, definitely', as it reflects a positive service user experience. The remaining option, 'Yes, to some extent', was assigned a score of 5 as the service user did not fully understand their care plan. Hence it was placed on the midpoint of the scale.

If the service user did not know, or did not have a care plan, this was classified as a 'not applicable' response, as this option was not a direct measure of the explanations that had been given.

Figure A1 Scoring example:
Question 22 (2013 Community Mental Health Survey)

Q22. Do you understand what is in your NHS care plan?	
Yes, definitely	10
Yes, to some extent	5
No, I don't understand it	0
I don't know / can't remember what is in my care plan	Not applicable
I do not have a care plan	Not applicable

Where a number of options lay between the negative and positive responses, they were placed at equal intervals along the scale. For example, question 21 asks how well their care co-ordinator (or lead professional) organises the care and services they receive. (Figure A2). The following response options were provided:

- Very well
- Quite well
- Not very well
- Not at all well

A score of 10 was assigned to the option 'Very well', as this represents best outcome in terms of service user experience. A response of 'not at all well' was given a score of 0. The remaining two answers were assigned a score that reflected their position in terms of quality of experience, spread evenly across the scale and shown in Figure A2 below.

Figure A2 Scoring example:
Question 21 (2013 Community Mental Health Survey)

Q21. How well does your care co-ordinator (or lead professional) organise the care and services you receive?	
Very well	10
Quite well	6.7
Not very well	3.3
Not at all well	0

Details of the method used to calculate the scores for each trust, for individual questions and each section of the questionnaire, are available in Appendix B. This also includes an explanation of the technique used to identify scores that are better, worse or about the same as most other trusts.

The below sets out the scoring assigned to each question used in the analysis.

Section 1: Health and social care workers

4. Did this person listen carefully to you?

Yes definitely	10
Yes to some extent	5
No	0

Answered by all

5. Did this person take your views into account?

Yes definitely	10
Yes to some extent	5
No	0

Answered by all

6. Did you have trust and confidence in this person?

Yes definitely	10
Yes to some extent	5
No	0

Answered by all

7. Did this person treat you with respect and dignity?

Yes definitely	10
Yes to some extent	5
No	0

Answered by all

8. Were you given enough time to discuss your condition and treatment?

Yes definitely	10
Yes to some extent	5
No	0

Answered by all

Section 2: Medications

10. Do you think your views were taken into account in deciding which medicines to take?

Yes definitely	10
Yes to some extent	5
No	0

Answered by those who had taken prescribed medication for their mental health condition in the last 12 months

12. Were the purposes of the medication explained to you?

Yes definitely	10
Yes to some extent	5
No	0

Answered by those who were prescribed any new medication in the last 12 months

13. Were you told about possible side effects of the medication?

Yes definitely	10
Yes to some extent	5
No	0

Answered by those who were prescribed any new medication in the last 12 months

14. The last time you had a new medication prescribed for your mental health condition, were you given information about it in a way that was easy to understand?

Yes definitely	10
Yes to some extent	5
No	0

Answered by those who were prescribed any new medication in the last 12 months

16. In the last 12 months, has a mental health or social care worker checked with you about how you are getting on with your medicines (i.e. have your medicines been reviewed)?

Yes	10
No	0

Answered by those who had been on prescribed medication for 12 months or longer

Section 3: Talking therapies

18. Did you find the NHS talking therapy you received in the last 12 months helpful?

Yes definitely	10
Yes to some extent	5
No	0
Can't say at present	Not applicable

Answered by those who had received talking therapies in the last 12 months

Section 4: Your care coordinator

19. Do you know who your Care Co-ordinator (or lead professional) is?	
Yes	10
No	0
Not sure	0

Answered by all

20. Can you contact your Care Co-ordinator (or lead professional) if you have a problem?	
Yes always	10
Yes sometimes	5
No	0

Answered by those know who their care co-ordinator is

21. How well does your Care Co-ordinator (or lead professional) organise the care and services you need?	
Very well	10
Quite well	6.7
Not very well	3.3
Not at all well	0

Answered by those know who their care co-ordinator is

Section 5: Your care plan

22. Do you understand what is in your NHS care plan?	
Yes definitely	10
Yes to some extent	5
No	0
I don't know / can't remember what is in my care plan	Not Applicable
I do not have a care plan	Not Applicable

Answered by all

23. Do you think your views were taken into account when deciding what was in your NHS care plan?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care plan and could remember what was in it

24. Does your NHS care plan set out your goals? This might include the changes you want to make to your life as your care progresses or the things you want to achieve.	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care plan and could remember what was in it

25. Have NHS mental health services helped you start achieving these goals?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care plan and could remember what was in it

26. Does your NHS care plan cover what you should do if you have a crisis (e.g. if you are not coping or if you may need to be admitted to a mental health ward)?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care plan and could remember what was in it

27. Have you been given (or offered) a written or printed copy of your NHS care plan?	
Yes, in the last year	10
Yes, more than one year ago	5
No	0
Don't know / Not sure	Not Applicable

Answered by those that had a care plan

Section 6: Your care review

28. In the last 12 months have you had a care review meeting to discuss your care?	
Yes, I have had more than one	10
Yes, I have had one	10
No, I have not had a care review in the last 12 months	0
Don't know / Can't remember	Not Applicable

Answered by all

29. Were you told that you could bring a friend, relative or advocate to your care review meetings?	
Yes	10
No	0
Don't know / can't remember	Not applicable

Answered by those that had a care review meeting in the last 12 months

30. Before the review meeting, were you given a chance to talk to your care co-ordinator about what would happen?	
Yes	10
No	0
Don't know / can't remember	Not applicable

Answered by those that had a care review meeting in the last 12 months

31. Were you given a chance to express your views at the meeting?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care review meeting in the last 12 months

32. Did you find the care review helpful?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care review meeting in the last 12 months

33. Did you discuss whether you needed to continue using NHS mental health services?	
Yes definitely	10
Yes to some extent	5
No	0

Answered by those that had a care review meeting in the last 12 months

Section 7: Crisis care

34. Do you have the number of someone from your local NHS mental health service that you can phone out of office hours?	
Yes	10
No	0
Not sure / Don't know	Not applicable

Answered by all

36. The last time you called the number, did you get the help you wanted?	
Yes definitely	10
Yes to some extent	5
No	0
I could not get through to anyone	Not applicable

Answered by those who had used the out of office number in the last 12 months

Section 8: Day to day living

37. Has anyone in NHS mental health services ever asked you about your alcohol intake?	
Yes	10
No	0
Don't know / Can't remember	Not applicable

Answered by all

38. Has anyone in NHS mental health services ever asked you about your use of non-prescription drugs?	
Yes	10
No	0
Don't know / Can't remember	Not applicable

Answered by all

39. In the last 12 months, did anyone in NHS mental health services ask you about any physical health needs you might have?	
Yes	10
No	0
Don't know / Can't remember	Not applicable

Answered by all

40. In the last 12 months, have you received support from anyone in NHS mental health services in getting help with your physical health needs?	
Yes definitely	10
Yes to some extent	5
No, but I would have liked support	0
I do not have any physical health needs	Not applicable

Answered by all

41. In the last 12 months, have you received support from anyone in NHS mental health services in getting help with your care responsibilities (including looking after children)?	
Yes definitely	10
Yes to some extent	5
No, but I would have liked support	0
I do not need any support	Not applicable
I do not have any caring responsibilities	Not applicable

Answered by all

42. In the last 12 months, have you received support from anyone in NHS mental health services in getting help with finding or keeping work (e.g. being referred to an employment scheme)?	
Yes definitely	10
Yes to some extent	5
No, but I would have liked support	0
I do not need any support	Not applicable
I am unable to work because of my mental health problems	Not applicable

Answered by all

43. In the last 12 months, have you received support from anyone in NHS mental health services in getting help with finding and/or keeping your accommodation?	
Yes definitely	10
Yes to some extent	5
No, but I would have liked support	0
I do not need any support	Not applicable

Answered by all

44. In the last 12 months, have you received support from anyone in NHS mental health services in getting help with financial advice or benefits (e.g. Housing Benefit, Income Support, Disability Living Allowance)?	
Yes definitely	10
Yes to some extent	5
No, but I would have liked support	0
I do not need any support	Not applicable

Answered by all

Section 9: Overall experiences

68. Overall…	
I had a very poor experience	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
I had a very good experience	10

Answered by all

46. Have NHS mental health services involved a member of your family or someone else close to you, as much as you would like?	
Yes definitely	10
Yes to some extent	5
No	0
My friends of family did not want or need to be involved	Not applicable
I did not want my friends of family to be involved	Not applicable

Answered by all

Appendix B: Calculating the trust score and category

Calculating trust scores

The scores for each question and section in each trust were calculated using the method described below.

Weights were calculated to adjust for any variation between trusts that resulted from differences in the age and sex groupings of respondents. A weight was calculated for each respondent by dividing the national proportion of respondents in their age/sex group by the corresponding trust proportion. The reason for weighting the data was that younger people and women tend to be more critical in their responses than older people and men. If a trust had a large population of young people or women, their performance might be judged more harshly than if there was a more consistent distribution of age and sex of respondents.

Weighting survey responses

The first stage of the analysis involved calculating national age/ sex proportions. It must be noted that the term “national proportion” is used loosely here as it was obtained from pooling the survey data from all trusts, and was therefore based on the respondent population rather than the entire population of England.

The questionnaire asked respondents to state their year of birth. The approximate age of each service user was then calculated by subtracting the figure given from 2013. The respondents were then grouped according to the categories shown in Figure B1.

If a service user did not fill in their year of birth or sex on the questionnaire, this information was inputted from the sample file. If information on a respondent’s age and/or sex was missing from both the questionnaire and the sample file, the service user was excluded from the analysis as it is not possible to assign a weight.

The national age/sex proportions relate to the proportion of men, and women of different age groups. As shown in Figure B1 below, the proportion of respondents who were male and aged 51 to 65 years is 0.115; the proportion who were women and aged 51 to 65 years is 0.144, etc.

Figure B1 National Proportions

Sex	Age Group	National proportion 2013
Men	≤35	0.056
	36-50	0.115
	51-65	0.115
	66+	0.144
Women	≤35	0.082
	36-50	0.142
	51-65	0.144
	66+	0.202

Note: All proportions are given to three decimals places for this example. The analysis included these figures to nine decimal places, and can be provided on request from the CQC surveys team at patient.survey@cqc.org.uk.

These proportions were calculated for each trust, using the same procedure.

The next step was to calculate the weighting for each individual. Age/sex weightings were calculated for each respondent by dividing the national proportion of respondents in their age/sex group by the corresponding trust proportion.

If, for example, a lower proportion of men who were aged between 51 and 65 years within Trust A responded to the survey, in comparison with the national proportion, then this group would be under-represented in the final scores. Dividing the national proportion by the trust proportion results in a weighting greater than one for members of this group (Figure B2). This increases the influence of responses made by respondents within that group in the final score, thus counteracting the low representation.

Figure B2 Proportion and Weighting for Trust A

Sex	Age Group	National Proportion	Trust A Proportion	Trust A Weight (National/Trust A)
Men	≤35	0.056	0.036	1.556
	36-50	0.115	0.071	1.620
	51-65	0.115	0.094	1.223
	66+	0.144	0.189	0.762
Women	≤35	0.082	0.092	0.891
	36-50	0.142	0.114	1.246
	51-65	0.144	0.168	0.857
	66+	0.202	0.236	0.856

Note: All proportions are given to three decimals places for this example. The analysis included these figures to nine decimal places

Likewise, if a considerably higher proportion of women who aged between 36 and 50 from Trust B responded to the survey (Figure B3), then this group would be over-represented within the sample, compared with national representation of this group. Subsequently this group would have a greater influence over the final score. To counteract this, dividing the national proportion by the proportion for Trust B results in a weighting of less than one for this group.

Figure B3 Proportion and Weighting for Trust B

Sex	Age Group	National Proportion	Trust B Proportion	Trust B Weight (National/Trust B)
Men	≤35	0.056	0.032	1.750
	36-50	0.115	0.058	1.983
	51-65	0.115	0.124	0.927
	66+	0.144	0.188	0.766
Women	≤35	0.082	0.068	1.206
	36-50	0.142	0.207	0.686
	51-65	0.144	0.112	1.286
	66+	0.202	0.211	0.957

Note: All proportions are given to three decimals places for this example. The analysis included these figures to nine decimal places

To prevent the possibility of excessive weight being given to respondents in an extremely under-represented group, the maximum value for any weight was set at five. There was no minimum weight for respondents as applying very small weights to over-represented groups does not have the same potential to give excessive impact to the responses of small numbers of individual respondents.

Calculating question scores

The trust score for each question displayed on the website was calculated by applying the weighting for each respondent to the scores allocated to each response.

The responses given by each respondent were entered into a dataset using the 0-10 scale described in section 4.1 and outlined in Appendix A. Each row corresponded to an individual respondent, and each column related to a survey question. For those questions that the respondent did not answer (or received a "not applicable" score for), the relevant cell remained empty. Alongside these were the weightings allocated to each respondent (Figure B4).

Figure B4 Scoring for the 'Health and Social Care workers' section, 2013 Community Mental Health survey, Trust B

Respondent	Scores					
	Q4	Q5	Q6	Q7	Q8	Weight
1	.	5	.	10	5	1.750
2	5	10	10	5	.	0.766
3	.	5	0	0	10	1.286

Respondents' scores for each question were then multiplied individually by the relevant weighting, in order to obtain the numerators for the trust scores (Figure B5).

Figure B5 Numerators for the 'Health and Social Care workers' section, 2013 Community Mental Health survey, Trust B

Respondent	Scores					
	Q4	Q5	Q6	Q7	Q8	Weight
1		8.750		17.500	8.750	1.750
2	3.830	7.660	7.660	3.830		0.766
3		6.430	0.000	0.000	12.860	1.286

Obtaining the denominators for each domain score

A second dataset was then created. This contained a column for each question, grouped into domains, and again with each row corresponding to an individual respondent. A value of one was entered for the questions where a response had been given by the respondent, and all questions that had been left unanswered or allocated a scoring of "not applicable" were set to missing (Figure B6).

Figure B6 Values for non-missing responses, 'Health and Social Care workers' section, 2013 Community Mental Health survey, Trust B

Respondent	Scores					
	Q4	Q5	Q6	Q7	Q8	Weight
1	.	1	.	1	1	1.750
2	1	1	1	1	.	0.766
3	.	1	1	1	1	1.286

The denominators were calculated by multiplying each of the cells within the second dataset by the weighting allocated to each respondent. This resulted in a figure for each question that the respondent had answered (Figure B7). Again, the cells relating to the questions that the respondent did not answer (or received a 'not applicable' score for) remained set to missing.

Figure B7 Denominators for the 'Health and Social Care workers' section, 2013 Community Mental Health survey, Trust B

Respondent	Scores					
	Q4	Q5	Q6	Q7	Q8	Weight
1		1.750		1.750	1.750	1.750
2	0.766	0.766	0.766	0.766		0.766
3		1.286	1.286	1.286	1.286	1.286

The weighted mean score for each trust, for each question, was calculated by dividing the sum of the weighted scores for a question (i.e. numerators), by the weighted sum of all eligible respondents to the question (i.e. denominators) for each trust.

Using the example data for Trust B, we first calculated weighted mean scores for each of the three questions that contributed to the 'health and social care workers' section of the questionnaire.

Q4:	$\frac{3.830}{0.766}$	=	5
Q5:	$\frac{8.750 + 7.660 + 6.430}{1.750 + 0.766 + 1.286}$	=	22.136
Q6:	$\frac{7.660 + 0.000}{0.766 + 1.286}$	=	8.946
Q7:	$\frac{17.500 + 3.830 + 0.000}{1.750 + 0.766 + 1.286}$	=	23.382
Q8:	$\frac{8.750 + 12.860}{1.750 + 1.286}$	=	17.385

Calculating section scores

A simple arithmetic mean of each trust's question scores was then taken to give the score for each section. Continuing the example from above, then, Trust B's score for the 'health and social care section' section of the Community Mental Health Survey would be calculated as:

(5 + 22.136 + 8.946 + 23.382 17.385) / 5 = 5.494

Calculation of the expected ranges

Z statistics (or Z scores) are standardized scores derived from normally distributed data, where the value of the Z score translates directly to a p-value. That p-value then translates to what level of confidence you have in saying that a value is significantly different from the mean of your data (or your 'target' value).

A standard Z score for a given item is calculated as:

$$z_i = \frac{y_i - \theta_0}{s_i} \quad (1)$$

where: s_i is the standard error of the trust score[1],
y_i is the trust score
θ_0 is the mean score for all trusts

Under this banding scheme, a trust with a Z score of < -1.96 is labeled as "Worse" (significantly below average; p<0.025 that the trust score is below the national average), -1.96 < Z < 1.96 as "About the same", and Z > 1.96 as "Better" (significantly above average; p<0.025 that the trust score is above the national average) than what would be expected based on the national distribution of trust scores.

[1] Calculated using the method in Appendix C.

However, for measures where there is a high level of precision (the survey indicators sample sizes average around 400 to 500 per trust) in the estimates, the standard Z score may give a disproportionately high number of trusts in the significantly above/ below average bands (because s_i is generally so small). This is compounded by the fact that all the factors that may affect a trust's score cannot be controlled. For example, if trust scores are closely related to economic deprivation then there may be significant variation between trusts due to this factor, not necessarily due to factors within the trusts' control. In this situation, the data are said to be 'over dispersed'. That problem can be partially overcome by the use of an 'additive random effects model' to calculate the Z score (we refer to this modified Z score as the Z_D score). Under that model, we accept that there is natural variation between trust scores, and this variation is then taken into account by adding this to the trust's local standard error in the denominator of (1). In effect, rather than comparing each trust simply to one national target value, we are comparing them to a national distribution.

The Z_D score for each question and section was calculated as the trust score minus the national mean score, divided by the standard error of the trust score plus the variance of the scores between trusts. This method of calculating a Z_D score differs from the standard method of calculating a Z score in that it recognizes that there is likely to be natural variation between trusts which one should expect, and accept. Rather than comparing each trust to one point only (i.e. the national mean score), it compares each trust to a distribution of acceptable scores. This is achieved by adding some of the variance of the scores between trusts to the denominator.

The steps taken to calculate Z_D scores are outlined below.

<u>Winsorising Z-scores</u>
The first step when calculating Z_D is to 'Winsorise' the standard Z scores (from (1)). Winsorising consists of shrinking in the extreme Z-scores to some selected percentile, using the following method:

1. Rank cases according to their naive Z-scores.

2. Identify Z_q and $Z_{(1-q)}$, the 100q% most extreme top and bottom naive Z-scores. For this work, we used a value of q=0.2

3. Set the lowest 100q% of Z-scores to Z_q, and the highest 100q% of Z-scores to $_{(1-q)}$. These are the Winsorised statistics.

This retains the same number of Z-scores but discounts the influence of outliers.

Estimation of over-dispersion

An over dispersion factor $\hat{\phi}$ is estimated for each indicator which allows us to say if the data for that indicator are over dispersed or not:

$$\hat{\phi} = \frac{1}{I}\sum_{i=1}^{I} \boldsymbol{Z}_i^{\,2} \quad (2)$$

where I is the sample size (number of trusts) and z_i is the Z score for the *i*th trust given by (1). The Winsorised Z scores are used in estimating $\hat{\phi}$.

An additive random effects model

If I $\hat{\phi}$ is greater than (I - 1) then we need to estimate the expected variance between trusts. We take this as the standard deviation of the distribution of θ_i (trust means) for trusts, which are on target, we give this value the symbol $\hat{\tau}$, which is estimated using the following formula:

$$\hat{\tau}^2 = \frac{I\hat{\phi} - (I-1)}{\sum_i w_i - \sum_i w_i^2 \Big/ \sum_i w_i} \qquad (3)$$

where $w_i = 1 / s_i^2$ and $\hat{\phi}$ is from (2). Once $\hat{\tau}$ has been estimated, the Z_D score is calculated as:

$$z_i^D = \frac{y_i - \theta_0}{\sqrt{s_i^2 + \hat{\tau}^2}} \qquad (4)$$

Appendix C: Calculation of standard errors

In order to calculate statistical bandings from the data, it is necessary for CQC to have both trusts' scores for each question and section and the associated standard error. Since each section is based on an aggregation of question mean scores that are based on question responses, a standard error needs to be calculated using an appropriate methodology.

For the patient experience surveys, the z-scores are scores calculated for section and question scores, which combines relevant questions making up each section into one overall score, and uses the pooled variance of the question scores

Assumptions and notation

The following notation will be used in formulae:

X_{ijk}	is the score for respondent *j* in trust *i* to question *k*
Q	is the number of questions within section *d*
w_{ij}	is the standardization weight calculated for respondent *j* in trust *i*
Y_{ik}	is the overall trust *i* score for question *k*
Y_{id}	is the overall score for section *d* for trust *i*

Associated with the subject or respondent is a weight w_{ij} corresponding to how well the respondent's age/sex is represented in the survey compared with the population of interest.

Calculating mean scores

Given the notation described above, it follows that the overall score for trust *i* on question *k* is given as:

$$Y_{ik} = \frac{\sum_j w_{ij} X_{ijk}}{\sum_j w_{ij}}$$

The overall score for section *d* for trust *i* is then the average of the trust-level question means within section *d*. This is given as:

$$Y_{id} = \frac{\sum_{k=1}^{Q} Y_{ikd}}{Q}$$

Calculating standard errors

Standard errors are calculated for both sections and questions.

The variance within trust i on question k is given by:

$$\hat{\sigma}_{ik}^2 = \frac{\sum_j w_{ij}\left(X_{ijk} - Y_{ik}\right)^2}{\sum_j w_{ij}}$$

This assumes independence between respondents.

For ease of calculation, and as the sample size is large, we have used the biased estimate for variance.

The variance of the trust level average question score, is then given by:

$$V_{ik} = Var(Y_{ik}) = Var\left(\frac{\sum_j w_{ij} X_{ijk}}{\sum_j w_{ij}}\right)$$

$$= \frac{Var\left(\sum_j w_{ij} X_{ijk}\right)}{\left(\sum_j w_{ij}\right)^2}$$

$$= \frac{\hat{\sigma}_{ik}^2 \sum_j w_{ij}^2}{\left(\sum_j w_{ij}\right)^2}$$

Covariances between pairs of questions (here, *k* and *m*) can be calculated in a similar way:

$$COV_{ik.im}. = Cov(Y_{ik}, Y_{im}) = \frac{\hat{\sigma}_{ikm} \sum_j w_{ij}^2}{\left(\sum_j w_{ij}\right)^2}$$

Where $\hat{\sigma}_{ikm} = \frac{\sum_j w_{ij}(X_{ijk} - Y_{ik})(X_{ijm} - Y_{im})}{\sum_j w_{ij}}$

Note: w_{ij} is set to zero in cases where patient *j* in trust *i* did not answer both questions *k* and *m*.

The trust level variance for the section score *d* for trust *i* is given by:

$$V_{id} = Var(Y_{id}) = \frac{1}{Q^2}\left\{\sum_{k=1}^{Q} V_{ik} + 2\sum_{k=2}^{Q}\sum_{m=1}^{k-1} COV_{ik,im}\right\}$$

The standard error of the section score is then:

$$SE_{id} = \sqrt{V_{id}}$$

This simple case can be extended to cover sections of greater length.