Care Quality Commission (CQC)

Technical details – patient survey information
2017 Inpatient Survey
June 2018

Contents

1. Introduction

This document outlines the methods used by the Care Quality Commission (CQC) to score and analyse trust level results for the 2017 Inpatient Survey, as available on the Care Quality Commission website, and in the benchmark report for each trust.

The survey results are available for each trust on the CQC website. Here, survey data are shown 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. This analysis is done using a statistic called the **'expected range'** (see section 5.3). On publication of the survey, an A-to-Z list of trust names will be available at the link below, containing further links to the survey data for all NHS trusts that took part in the survey: www.cqc.org.uk/inpatientsurvey

A benchmark report is also available for each trust. Results displayed in the benchmark report are a graphical representation of the results displayed for the public on the CQC website (see further information section). These have been provided to all trusts and will be available on the Survey Coordination Centre's website at: **http://nhssurveys.org/surveys/1222** . The tables in the back of each benchmark report also highlight any statistically significant changes in the trust score between 2017 and 2016.

The CQC webpage also contains national and trust level results for England, comparing against results for previous surveys.

2. Selecting data for 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 section 5 "Scoring individual questions" 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: 'Did you have an operation or procedure?') or those used for descriptive or information purposes.

The scores for each question are grouped on the website and in the benchmark reports according to the sections of the questionnaire completed by respondents. For example, the Inpatient Survey includes sections on 'the accident and emergency department', 'the hospital and ward' and 'care and treatment' among others. The average score for each trust, for each section, was calculated and will be presented on the website and in the benchmark reports.

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

- Better
- About the same
- Worse

This analysis is done using a statistic called the **'expected range'** (see section 5.3)

3. The CQC organisation search tool

The organisation search tool contains information from various areas within the CQC'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; so as to show where we are more confident that a trust's score is 'better' or 'worse' than we'd expect, when compared with most other trusts.

The survey data can be found from the A to Z link available at: www.cqc.org.uk/inpatientsurvey

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

4. Trust benchmark reports

Benchmark reports should be used by NHS trusts to identify how they are performing in relation to all other trusts that took part in the survey. They also show if a score has significantly increased or decreased compared with the last survey. This enables areas for improvement to be identified.

The graphs included in the reports display the scores for a trust, compared with the full range of results from all other trusts that took part in the survey. Each bar represents the range of results for each question, across all trusts that took part in the survey. In the graphs, the bar is divided into three sections:

- If a trust score lies in the orange section of the graph, the trust result is 'about the same' as most other trusts in the survey
- If a trust scores lies in the red section of the graph, the trust result is 'worse' than expected when compared with most other trusts in the survey.
- If your score lies in the green section of the graph, the trust result is 'better' than expected when compared with most other trusts in the survey

A black diamond represents the score for this trust. The black diamond (score) is not shown for questions answered by fewer than 30 people because the uncertainty around the result would be too great.

5. Interpreting the data

5.1 Scoring

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 patient's experience could be improved. A score of 0 is assigned to all responses that reflect considerable scope for improvement, whereas a response that was assigned a score of 10 refers to the most positive patient experience possible. Where a number of options lay between the negative and positive responses, they are placed at equal intervals along the scale. Where options were provided that did not have any bearing on the trust's performance, in terms of patient experience, the responses are classified as "not

applicable" and a score is not given. Where respondents stated they could not remember or did not know the answer to a question, a score is not given.

5.2 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. Older respondents, for example, tend to report more positive experiences than younger respondents, and women tend to report less positive experiences than men. The mix of patients varies across trusts, and this could lead to bias, resulting in a trust appearing better or worse than they would if they had a slightly different profile of patients. 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 inpatient survey is standardised by: age, gender and method of admission (emergency or elective).

5.3 Expected range

The better / about the same / worse categories are based on the 'expected range', which is calculated for each question. 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). Analysing the survey information in such a way allows for fairer conclusions to be made in terms of each trust's performance, and allows the findings to be presented in a way that both takes in to account of all necessary factors, as well as being 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.

5.4 Comparing scores across or within trusts, or across survey years

The expected range statistic is used to arrive at a judgement of 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 2016 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.

5.5 Conclusions made on performance

It should be noted that the data only show performance relative to other trusts; we have not set out absolute thresholds for 'good' or 'bad' performance. Thus, a trust may have a low score for a specific question, while still performing very well on the whole. This is particularly true on questions where the majority of trusts exhibit a high score.

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. Hence, it is more accurate to look at actual changes in scores and to test for statistically significant differences.

6. Further information

The full national results 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):
http://www.cqc.org.uk/inpatientsurvey

The results for the adult inpatient surveys from 2002 to 2016 can be found at:
http://www.nhssurveys.org/surveys/425

Full details of the methodology of the survey can be found at:
http://www.nhssurveys.org/surveys/1084

More information on the NHS patient survey programme is available at:
http://www.cqc.org.uk/content/surveys

More information about how CQC monitors hospitals is available on the CQC website at:
http://www.cqc.org.uk/content/monitoring-nhs-acute-hospitals

Appendix A: Scoring for the 2017 Inpatients Survey results

The following describes the scoring system applied to the evaluative questions in the survey. Taking question 23 as an example (Figure A1), it asks respondents whether the doctor answered their questions in a way they could understand. The option of "No" was allocated a score of 0, as this suggests that the experiences of the patient need to be improved. A score of 10 was assigned to the option 'Yes, always', as it reflects the most positive patient experience. The remaining option, 'Yes, sometimes', was assigned a score of 5 as the patient did not always receive understandable answers. Hence it was placed on the midpoint of the scale.

If the patient did not have any questions to ask, this was classified as a 'not applicable' response.

Figure A1 Scoring example:
Question 23 (2017 Inpatient Survey)

Q23. When you had important questions to ask a doctor, did you get answers that you could understand?	
Yes, always	10
Yes, sometimes	5
No	0
I had no need to ask	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 16 asks respondents how clean the hospital room or ward they were in was, (Figure A2). The following response options were provided:

- Very clean
- Fairly clean
- Not very clean
- Not at all clean

A score of 10 was assigned to the option 'very clean', as this represents the best outcome in terms of patient experience. A response that the room or ward was 'not at all clean' 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. Hence the option 'fairly clean' was assigned a score of 6.7, and 'not very clean' was given a score of 3.3.

Figure A2 Scoring example:
Question 16 (2017 Inpatient Survey)

Q16. In your opinion, how clean was the hospital room or ward that you were in?	
Very clean	10
Fairly clean	6.7
Not very clean	3.3
Not at all clean	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.

All analysis is carried out on a 'cleaned' data set. 'Cleaning' refers to the editing process that is undertaken on the survey data, and a document describing this can be found at: http://www.nhssurveys.org/surveys/1999

As part of the cleaning process, responses are removed from any trust that has fewer than 30 respondents to a question. This is because the uncertainty around the result is too high, and very low numbers would risk respondents being recognised from their responses. However, please note that when scoring the data, there are **exceptions to this rule for questions fifty, fifty-one, and fifty-two.** This is due to these questions having composite scoring; the results from two or more questions are used to create a single score. If a trust has fewer than thirty responses to a question used in composite scoring, that information is retained during the calculation of the composite score, so as to enable fairer scoring.

For example, Q51 and Q52, if Q50 is 'yes', are scored together to provide a score based on reason and length of discharge. If a respondent answered 'I had to wait for medicines', 'I had to wait to see the doctor', or 'I had to wait for an ambulance' to Q51 the score for Q52 is assigned for both questions.

The scoring rules for Q51 and Q52 state that if Q51 is missing then Q52 will still be scored.

If fifty respondents answered Q51, and that only twenty respondents answer Q52, which asks the length of delay to discharge. Following the cleaning rules, these responses would be cleaned out due to being less than thirty.

Please note that, in any instances of low numbers of respondents to questions included in composite scoring, such responses would be cleaned for all other outputs. As such, they do not contribute the national results, nor are they included in the anonymised data set submitted to the UK Data Archive.

The below details the scoring allocated to each of the 'scored questions'.

Section 1: The Accident and Emergency Department (A&E)

3. While you were in the A&E Department, how much information about your condition or treatment was given to you?	
Not enough	5
Right amount	10
Too much	5
I was not given any information about my condition or treatment	0
Don't know / Can't remember	Not applicable

Answered by those who went to the A&E department

4. Were you given enough privacy when being examined or treated in the A&E Department?	
Yes, definitely	10
Yes, to some extent	5
No	0
Don't know / Can't remember	Not applicable

Answered by those who went to the A&E department

Section 2: Waiting lists and planned admissions

6. How do you feel about the length of time you were on the waiting list before your admission to hospital?	
I was admitted as soon as I thought was necessary	10
I should have been admitted a bit sooner	5
I should have been admitted a lot sooner	0

Answered by those who had a planned admission

7. Was your admission date changed by the hospital?	
No	10
Yes, once	6.7
Yes, 2 or 3 times	3.3
Yes, 4 times or more	0

Answered by those who had a planned admission

8. In your opinion, had the specialist you saw in hospital been given all of the necessary information about your condition or illness from the person who referred you?	
Yes, definitely	10
Yes, to some extent	5
No	0
Don't know / can't remember	Not applicable

Answered by those who had a planned admission

Section 3: All types of admission

9. From the time you arrived at the hospital, did you feel that you had to wait a long time to get to a bed on a ward?	
Yes, definitely	0
Yes, to some extent	5
No	10

Answered by all

Section 4: The hospital and ward

11. While in hospital, did you ever share a sleeping area, for example a room or a bay, with patient for the opposite sex?	
Yes	0
No	10

Note: single sex trusts were excluded from this question.

13. Did the hospital staff explain the reasons for being moved in a way you could understand?

Yes, completely	10
Yes, to some extent	5
No	0

Answered by those who changed wards at night

14. Were you ever bothered by noise at night from other patients?

Yes	0
No	10

Answered by all

15. Were you ever bothered by noise at night from hospital staff?

Yes	0
No	10

Answered by all

16. In your opinion, how clean was the hospital room or ward that you were in?

Very clean	10
Fairly clean	6.7
Not very clean	3.3
Not at all clean	0

Answered by all

17. Did you get enough help from staff to wash or keep yourself clean?

Yes, always	10
Yes, sometimes	5
No	0
I did not need help to wash or keep myself clean	Not applicable

Answered by all

18. If you brought your own medication with you to hospital, were you able to take it when you needed to?

Yes, always	10
Yes, sometimes	5
No	0
I had to stop taking my own medication as part of my treatment	Not applicable
I did not bring my own medication with me to hospital	Not applicable

Answered by all

19. How would you rate the hospital food?

Very good	10
Good	6.7
Fair	3.3
Poor	0
I did not have any hospital food	Not applicable

Answered by all

20. Were you offered a choice of food?

Yes, always	10
Yes, sometimes	5
No	0

Answered by all

21. Did you get enough help from staff to eat your meals?

Yes, always	10
Yes, sometimes	5
No	0
I did not need help to eat meals	Not applicable

Answered by all

22. During your time in hospital, did you get enough to drink?

Yes	10
No, because I did not get enough help to drink	0
No, because I was not offered enough drinks	0
No, for another reason	Not applicable

Section 5: Doctors

23. When you had important questions to ask a doctor, did you get answers that you could understand?

Yes, always	10
Yes, sometimes	5
No	0
I had no need to ask	Not applicable

Answered by all

24. Did you have confidence and trust in the doctors treating you?

Yes, always	10
Yes, sometimes	5
No	0

Answered by all

25. Did doctors talk in front of you as if you weren't there?

Yes, often	0
Yes, sometimes	5
No	10

Answered by all

Section 6: Nurses

26. When you had important questions to ask a nurse, did you get answers that you could understand?

Yes, always	10
Yes, sometimes	5
No	0
I had no need to ask	Not applicable

Answered by all

27. Did you have confidence and trust in the nurses treating you?

Yes, always	10
Yes, sometimes	5
No	0

Answered by all

28. Did nurses talk in front of you as if you weren't there?

Yes, often	0
Yes, sometimes	5
No	10

Answered by all

29. In your opinion, were there enough nurses on duty to care for you in hospital?

There were always or nearly always enough nurses	10
There were sometimes enough nurses	5
There were rarely or never enough nurses	0

Answered by all

30. Did you know which nurse was in charge of looking after you? (this would have been a different person after each sift change)

Yes, always	
Yes, sometimes	
No	

Answered by all

Section 7: Care and Treatment

31. Did you have confidence and thrust in any other clinical staff treating you (e.g physiotherapists, speech therapists, psychologists)?	
Yes, always	10
Yes, sometimes	5
No	0
Don't know/ Can't remember	Not applicable

32. In your opinion, did the members of staff caring for you work well together?	
Yes, always	10
Yes, sometimes	5
No	0
Don't know/ Can't remember	Not applicable

Answered by all

33. Sometimes in a hospital, a member of staff will say one thing and another will say something quite different. Did this happen to you?	
Yes, often	0
Yes, sometimes	5
No	10

Answered by all

34. Were you involved as much as you wanted to be in decisions about your care and treatment?	
Yes, definitely	10
Yes, to some extent	5
No	0

Answered by all

35. Did you have confidence in decisions made about your condition or treatment?	
Yes, always	10
Yes, sometimes	5
No	0

Answered by all

36. How much information about your condition or treatment was given to you?	
Not enough	5
The right amount	10
Too much	5
I was not given any information about my treatment or condition	0
Don't know/ can't remember	Not applicable

Answered by all

37. Did you find someone on the hospital staff to talk to about your worries and fears?

Yes, definitely	10
Yes, to some extent	5
No	0
I had no worries or fears	Not applicable

Answered by all

38. Do you feel you got enough emotional support from hospital staff during your stay?

Yes, always	10
Yes, sometimes	5
No	0
I did not need any emotional support	Not applicable

Answered by all

39. Were you given enough privacy when discussing your condition or treatment?

Yes, always	10
Yes, sometimes	5
No	0

Answered by all

40. Were you given enough privacy when being examined or treated?

Yes, always	10
Yes, sometimes	5
No	0

Answered by all

42. Do you think the hospital staff did everything they could to help control your pain?

Yes, definitely	10
Yes, to some extent	5
No	0

Answered by those who said they were ever in any pain

43. If you needed attention, were you able to get a member of staff to help you within a reasonable time?

Yes, always	10
Yes, sometimes	5
No	0
I did not want/need this	Not applicable

Answered by all

Section 8: Operations and Procedures

45. Beforehand, did a member of staff answer your questions about the operation or procedure in a way you could understand?

Yes, completely	10
Yes, to some extent	5
No	0
I did not have any questions	Not Applicable

Answered by those who had an operation or procedure during their stay in hospital

46. Beforehand, were you told how you could expect to feel after you had the operation or procedure?

Yes, completely	10
Yes, to some extent	5
No	0

Answered by those who had an operation or procedure during their stay in hospital

47. After the operation or procedure, did a member of staff explain how the operation or procedure had gone in a way you could understand?

Yes, completely	10
Yes, to some extent	5
No	0

Answered by those who had an operation or procedure during their stay in hospital

Section 9: Leaving Hospital

48. Did you feel you were involved in decisions about your discharge from hospital?

Yes definitely	10
Yes, to some extent	5
No	0
I did not want to be involved	Not Applicable

Answered by all

49. Were you given enough notice about when you were going to be discharged?

Yes, definitely	10
Yes, to some extent	5
No	0

Answered by all

50. On the day you left hospital, was your discharge delayed for any reason?

Yes	0
No	10

Answered by all

51. What was the MAIN reason for the delay? (Cross ONE box only)

I had to wait for medicines	0
I had to wait to see the doctor	0
I had to wait for an ambulance	0
Something else	Not Applicable

Answered by those who said that their discharge was delayed
If response to Q50 is 2 (discharge WAS NOT delayed), Q51 is scored 10.

If response to Q50 is 1 (discharge WAS delayed), and response to Q51 is 1, 2, 3 or 4, the scores above are assigned to Q56. If Q50 is missing, Q56 is not scored. If Q51 is missing, scoring is as per Q50 and Q52.

If a trust has fewer than 30 respondents to Q50, responses are not cleaned out to enable fairer scoring.

52. How long was the delay?

Up to 1 hour	7.5
Longer than 1 hour but no longer than 2 hours	5
Longer than 2 hours but no longer than 4 hours	2.5
Longer than 4 hours	0

Answered by those who said that their discharge was delayed

If response to Q51 is 4 (some other reason for the delay), Q52 is not scored.
If response to Q50 is 2 (discharge WAS NOT delayed), Q51 is scored 10.
If response to Q50 is 1 (discharge WAS delayed) AND the response to Q50 is 1, 2 or 3, the scores above are assigned to Q51 and Q52.
If response to Q50 is 1 (discharge WAS delayed) AND the response to Q51 is missing, the scores above are assigned to Q50 and Q52.
If response to Q50 is 1 (discharge WAS delayed) AND the response to Q52 is missing, Q52 is not scored.
If response to Q50 is missing, Q52 is not scored

If a trust has fewer than 30 respondents to Q50, responses are not cleaned out to enable fairer scoring.

54. After leaving hospital, did you get enough support from health or social care professionals to help you recover and manage your condition?

Yes, definitely	10
Yes, to some extent	5
No, but support would have been useful	0
Do, but I did not need any support	Not Applicable

Answered by those who said they went home or stayed with family or friends after leaving hospital.

Q54: This question does not contribute to the Section score for ‘Leaving hospital’ (Section 9), though is displayed for trusts where 30 or more respondents answered this question. In the instances where 30 or more respondents answered this question, the question score is displayed for the trust. If the row for Q54 is blank, this means that less than 30 responses were received for this question.

55. When you left hospital, did you know what would happen next with your care?

Yes definitely	10
Yes, to some extent	5
No	0
It was not necessary	Not applicable

Answered by those who said they were transferred to another hospital, went to a residential nursing home or went somewhere else.

56. Before you left hospital, were you given any written or printed information about what you should or should not do after leaving hospital?

Yes	10
No	0

Answered by all

57. Did a member of staff explain the purpose of the medicines you were to take at home in a way you could understand?

Yes, completely	10
Yes, to some extent	5
No	0
I did not need an explanation	Not Applicable
I had no medicines	Not Applicable

Answered by all

58. Did a member of staff tell you about medication side effects to watch for when you went home?

Yes, completely	10
Yes, to some extent	5
No	0
I did not need an explanation	Not Applicable

Answered by those who were prescribed medication to take home

59. Were you told how to take your medication in a way you could understand?

Yes, definitely	10
Yes, to some extent	5
No	0
I did not need to be told how to take my medication	Not Applicable

Answered by those who were prescribed medication to take home

60. Were you given clear written or printed information about your medicines?

Yes, completely	10
Yes, to some extent	5
No	0
I did not need this	Not Applicable
Don’t know / Can’t remember	Not Applicable

Answered by those who were prescribed medication to take home

61. Did a member of staff tell you about any danger signals you should watch for after you went home?	
Yes, completely	10
Yes, to some extent	5
No	0
It was not necessary	Not Applicable

Answered by all

62. Did hospital staff take your family or home situation into account when planning your discharge?	
Yes, completely	10
Yes, to some extent	5
No	0
It was not necessary	Not Applicable
Don't know / Can't remember	Not Applicable

Answered by all

63. Did the doctors or nurses give your family or someone close to you all the information they needed to help care for you?	
Yes, definitely	10
Yes, to some extent	5
No	0
No family or friends were involved	Not Applicable
My family or friends did not want or need information	Not Applicable

Answered by all

64. Did hospital staff tell you who to contact if you were worried about your condition or treatment after you left hospital?	
Yes	10
No	0
Don't know / Can't remember	Not Applicable

Answered by all

65. Did hospital staff discuss with you whether you would need any additional equipment in your home, or any adaptations made to your home, after leaving hospital?	
Yes	10
No, but I would have liked them to	0
No, it was not necessary to discuss it	Not Applicable

Answered by all

66. Did hospital staff discuss with you whether you may need any further health or social care services after leaving hospital? (e.g. services from a GP, physiotherapist or community nurse, or assistance from social service or the voluntary sector)	
Yes	10
No, but I would have liked them to	0
No, it was not necessary to discuss it	Not Applicable

Answered by all

Section 10: Overall

67. Overall, did you feel you were treated with respect and dignity while you were in the hospital?	
Yes, always	10
Yes, sometimes	5
No	0

Answered by all

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

69. During your hospital stay, were you ever asked to give your views on the quality of your care?	
Yes	10
No	0
Don’t know / Can’t remember	Not Applicable

Answered by all

70. Did you see, or were you given, any information explaining how to complain about the care you received?	
Yes	10
No	0
Not sure / Don’t know	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, sex and method of admission (planned or elective) of respondents. A weight was calculated for each respondent by dividing the national proportion of respondents in their age/sex/admission type 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 negatively 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/ admission method 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.

All respondents at both Birmingham and Liverpool Women’s NHS Foundation Trusts are coded as ‘female’, even where self-reported gender is coded as male. These trusts are then weighted using the national all female population as a reference.

The questionnaire asked respondents to state their year of birth. The approximate age of each patient was then calculated by subtracting the figure given from 2017. The respondents were then grouped according to the categories shown in Figure B1.

If a patient 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 patient was excluded from the analysis.

Question 1 asked “Was your most recent hospital stay planned in advance or an emergency?” Respondents that ticked “emergency or urgent” were classed as emergency patients for the purpose of the weightings. Those who ticked “waiting list or planned in advance” were classed as elective patients. However, if respondents ticked “something else” or did not answer question 1, information was taken from other responses to the questionnaire to determine the method of admission.

<u>Emergency admission:</u>

- If the respondent answered "emergency or urgent" at question 1.

Or

- If the respondent answered “something else” or did not respond to question 1, and answered ‘yes’ to question 2.

Or

- If the respondent answered “something else” or did not respond to question 1, did not answer question 2, but responded to one or more of questions 3 or 4.

Elective admission:

- If the respondent answered "waiting list or planned in advance" at question 1.

Or

- If the respondent answered “something else” or did not respond to question 1, and answered ‘no’ to question 2.

Or

- If the respondent answered "something else" or did not respond to question 1, did not answer questions 2, 3 and 4 and gave at least one response to questions 5, 6, 7 and 8.

All other combinations of responses for questions 1 to 8 resulted in the respondent being excluded from the analysis, as it was not possible to determine admission method.

The national age/sex/admission method proportions relate to the proportion of men, and women of different age groups who had emergency or elective admission. As shown in Figure B1, the proportion of respondents who were male, admitted as emergencies, and aged 51 to 65 years is **0.076**; the proportion who were women, admitted as emergencies, and aged 51 to 65 years is **0.066** etc.

Figure B1 National Proportions

Admission Method	Sex	Age Group	National proportion 2017
Emergency	Men	≤35	0.046
		36-50	0.048
		51-65	0.076
		66+	0.183
	Women	≤35	0.063
		36-50	0.051
		51-65	0.066
		66+	0.207
Elective	Men	≤35	0.012
		36-50	0.014
		51-65	0.032
		66+	0.062
	Women	≤35	0.016
		36-50	0.026
		51-65	0.039
		66+	0.059

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/admission type weightings were calculated for each respondent by dividing the national proportion of respondents in their age/sex/admission type group by the corresponding trust proportion.

If, for example, a lower proportion of men who were admitted as emergencies 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 “1” 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	Admission	Age Group	National Proportion	Trust A Proportion	Trust A Weight (National/Trust A)
Men	Emergency	≤35	0.046	0.018	2.556
		36-50	0.048	0.035	1.371
		51-65	0.076	0.047	1.617
		66+	0.183	0.095	1.926
Women	Emergency	≤35	0.063	0.045	1.400
		36-50	0.051	0.057	0.895
		51-65	0.066	0.085	0.776
		66+	0.207	0.117	1.769
Men	Elective	≤35	0.012	0.018	0.667
		36-50	0.014	0.035	0.400
		51-65	0.032	0.047	0.681
		66+	0.062	0.095	0.653
Women	Elective	≤35	0.016	0.045	0.356
		36-50	0.026	0.057	0.456
		51-65	0.039	0.085	0.459
		66+	0.059	0.119	0.496

Note: All proportions are given to three decimals places for this example.

Likewise, if a considerably higher proportion of women admitted as emergency patients aged between 36 and 50 years 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	Admission	Age Group	National Proportion	Trust B Proportion	Trust B Weight (National/Trust B)
Men	Emergency	≤35	0.046	0.016	2.875
		36-50	0.048	0.029	1.655
		51-65	0.076	0.062	1.226
		66+	0.183	0.091	2.011
Women	Emergency	≤35	0.063	0.034	1.853
		36-50	0.051	0.075	0.680
		51-65	0.066	0.080	0.825
		66+	0.207	0.110	1.882
Men	Elective	≤35	0.012	0.016	0.750
		36-50	0.014	0.029	0.483
		51-65	0.032	0.062	0.516
		66+	0.062	0.097	0.639
Women	Elective	≤35	0.016	0.034	0.471
		36-50	0.026	0.075	0.347
		51-65	0.039	0.080	0.488
		66+	0.059	0.110	0.536

Note: All proportions are given to three decimals places for this example.

To prevent the possibility of excessive weight being given to respondents in an extremely underrepresented group, the maximum value for any weight was set at five.

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 3. 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 B6).

Figure B4 Example scoring for the ‘A&E Department’ section, 2017 Inpatients survey, Trust B

Respondent	Scores		Weight
	Q3	Q4	
1	10	0	1.882
2	5	10	0.750
3	.	5	0.483

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 Example numerators for the 'A&E' section, 2017 Inpatients survey, Trust B

Respondent	Scores		Weight
	Q3	Q4	
1	14.115	0	1.882
2	2.846	5.693	0.750
3	.	1.563	0.483

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 B8).

Figure B6 Example values for non-missing responses, 'A&E' section, 2017 Inpatients survey, Trust B

Respondent	Scores		Weight
	Q3	Q4	
1	1	1	1.882
2	1	1	0.750
3		1	0.483

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 B9). 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 B8).

Figure B7 Denominators for the "A&E" section, 2017 Inpatients survey, Trust B

Respondent	Score		Weight
	Q3	Q4	
1	1.882	1.882	1.882
2	0.750	0.750	0.750
3		0.483	0.483

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 'A&E' section of the questionnaire.

Q3: $\frac{14.115 + 2.846}{1.882 + 0.750} = 6.444$

Q4: $\frac{0.000 + 7.590 + 3.325}{0.750 + 0.759 + 0.647} = 5.063$

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 'Accident & Emergency' section of the Inpatients survey would be calculated as:

(6.444 + 5.063) / 2 = 5.753

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.

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

[1] Calculated using the method in **Appendix C**.

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, based on the method presented in Spiegelhalter et al (2012, p.9), are outlined below.

Winsorising Z-scores

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=0.1

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:

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

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:

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

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:

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

References

Spiegelhalter D., Sherlaw-Johnson, C., Bardsley, M., Blunt, I., Wood, C., & Grigg, O. (2012). Statistical methods for healthcare regulation: Rating, screening and surveillance. Journal of the Royal Statistical Society, 175(1), 1-47.

Appendix C: Calculation of standard errors

1. 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:

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