NHS Patient Survey Programme

# 2016 Children and young people's inpatient and day case survey

## Technical details for analysing trust-level results

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# 1. Introduction

This document outlines the methods used by the Care Quality Commission (CQC) to score and analyse trust level results for the 2016 Children and young people's inpatient and day case survey, as available on the Care Quality Commission website, and in the benchmark report for each trust.

The survey sought feedback directly from children and young people, alongside their parent or carer.

There were three versions of the questionnaire sent to young patients and their parent or carer. The questionnaire sent to children aged between 0 and 7 was completed solely by the parent or carer. Children aged between 8-11 or 12-15 received a questionnaire in two parts: a section for them to complete, and a section for their parent or carer to fill in. There were minor design and question differences between the two older age groups.

We asked parents and carers of 0 to 7 year olds some additional questions not included in the 8 to 15 versions of the questionnaires.

Survey data is therefore available for the three groups:

- Children and young people aged between 8 and 15 years[1]
- Parents or carers of 0 to 15 year olds
- Parents or carers of 0 to 7 year olds

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/childrenssurvey

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. These will be available on the Co-ordination Centre's website at: http://www.nhssurveys.org/surveys/1113

The CQC webpage also contains overall results for England.

[1] One question was asked to children aged 8-11 only and a further two questions were asked to young people aged 12-15 only.

# 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. 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: 'Was your child's visit to hospital planned or an emergency?') or those used for descriptive or information purposes.

Accompanying the question on the website is 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. It shows where we are 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/childrenssurvey

Or by searching for a hospital or trust from the CQC home page, 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. 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. In the graphs, the bar is divided into three sections:

- If a trust score lies in the grey section of the graph, the trust result is 'about the same' as most other trusts in the survey

- If a trust score lies in the orange section of the graph, the trust result is ‘worse’ than expected when compared with most other trusts in the survey.
- If a trust 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. No chart is 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 response that was assigned a score of 0 refers to the most negative patient experience we can measure. Whereas a response that was assigned a score of 10 refers to the most positive patient experience we can measure.

Where a number of options lay between the most 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 no score is given. Where respondents stated they could not remember or did not know the answer to a question, no score is given.

## 5.2 Standardisation

Results are based on ‘standardised’ data.  We know that the views of a respondent can reflect not only their experiences of NHS services, but can also relate to certain demographic characteristics; such as their age. 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 2016 children and young people’s inpatient and day case survey is standardised by: age group (survey version), route of admission (emergency or elective) and length of stay (0 or 1+ overnight stays).

## 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 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

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 between different trusts, you will need to undertake an appropriate statistical test to ensure that any changes are 'statistically significant'.

## 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.

A separate report is available on the CQC site www.cqc.org.uk/childrenssurvey looking at how overall results between trusts vary across the country. This report focuses on identifying significantly higher levels of better or worse patient experience **across the entire survey**, rather than considering performance on individual questions.

# 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: www.cqc.org.uk/childrenssurvey

Full details of the methodology of the survey can be found at: http://www.nhssurveys.org/surveys/953

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

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

# Appendix A: Scoring for the survey results

The following describes the scoring system applied to the evaluative questions in the survey. Taking question X14 as an example (Figure A1), it asks respondents whether they had confidence and trust in the members of staff treating their child. 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 on the midpoint of the scale.

**Figure A1 Scoring example:**
Question X14 (2016 children and young people's inpatient and day case survey)

| **X14.** Did you have confidence and trust in the members of staff treating your child? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

Where a number of options lay between the negative and positive responses, they were placed at equal intervals along the scale. For example, question X6 asks respondents about the cleanliness of the child's room or ward, (Figure A2). The following response options were provided:

- Very clean
- Quite 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 'quite clean' was assigned a score of 6.7, and 'not very clean' was given a score of 3.3.

**Figure A2 Scoring example:**
Question X6 (2016 children and young people's inpatient and day case survey)

| **X6.** How clean do you think the hospital room or ward was that your child was in? | |
|---|---|
| Very clean | 10 |
| Quite 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, 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/survey/1974.

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.

For clarity, please note that, in any instances of low numbers of respondents to questions, such responses would be cleaned for all other outputs. As such, they are not included in the anonymised data set submitted to the UK Data Archive.

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

**Key:**

- Question asked to parents or carers of children aged 0-7
- Question asked to parents or carers of children and young people aged 0-15
- Question asked to children and young people aged 8-15
- Question asked to children 8-11
- Question asked to young people aged 12-15

| **X2.** Did the hospital give you a choice of admission dates? | |
|---|---|
| Yes | 10 |
| No | 0 |
| Don't know / can't remember | - |

| **X3.** Did the hospital change your child's admission date at all? | |
|---|---|
| No | 10 |
| Yes, once | 5 |
| Yes, a few times | 0 |
| Don't know / can't remember | - |

| **X4.** For most of their stay in hospital what type of ward did your child stay on? | |
|---|---|
| A children's ward | 10 |
| An adult ward | 0 |
| A teenage / adolescent ward | 0[2] |

[2] Scoring for the *'A teenage / adolescent ward'* differs by age group: 0-7 '0/10', 8-11 '5/10', 12-15 '10/10'

| **X5.** Did the ward where your child stayed have appropriate equipment or adaptations for your child's physical or medical needs? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Don't know / can't remember | - |
| They did not need equipment or adaptations | - |

| **X6.** How clean do you think the hospital room or ward was that your child was in? | |
|---|---|
| Very clean | 10 |
| Quite clean | 6.7 |
| Not very clean | 3.3 |
| Not at all clean | 0 |

| **X7.** Was your child given enough privacy when receiving care and treatment? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X8.** Were there enough things for your child to do in the hospital | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Can’t remember / did not notice | - |

| **X9.** Did staff play with your child at all while they were in hospital? | |
|---|---|
| Yes | 10 |
| No, but I would have liked this | 0 |
| No, but I didn’t want / need them to so this | - |
| Don’t know / can’t remember | - |

| **X10.** Did new members of staff treating your child introduce themselves? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X11.** Did members of staff treating your child give you information about their care and treatment in a way that you could understand? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |

| **X12.** Did members of staff treating your child communicate with them in a way that your child could understand? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |

| **X13.** Did a member of staff agree a plan for your child's care with you? | |
|---|---|
| Yes | 10 |
| No | 0 |
| Don't know / can't remember | - |

| **X14.** Did you have confidence and trust in the members of staff treating your child? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X15.** Did staff involve you in decisions about your child's care and treatment? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not want to be involved | - |

| **X16.** Were you given enough information to be involved in decisions about your child's care and treatment? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |

| **X17.** Did hospital staff keep you informed about what was happening whilst your child was in hospital? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Don't know / can't remember | - |

| **X18.** Were you able to ask staff any questions you had about your child's care? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not want / need to ask any questions | - |
| Don't know / can't remember | - |

| **X19.** Did different staff give you conflicting information? | |
|---|---|
| Yes, a lot | 0 |
| Yes, sometimes | 5 |
| No, never | 10 |

| **X20.** Were the different members of staff caring for and treating your child aware of their medical history? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Don't know / not applicable | - |

| **X21.** Did you feel that staff looking after your child knew how to care for their individual or special needs? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Don't know / not applicable | - |

| **X22.** Were members of staff available when your child needed attention? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |
| Don't know / not applicable | - |

| **X23.** Did the members of staff caring for your child work well together? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| Don't know / can't remember | - |

| **X24.** Did your child like the hospital food provided? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| My child did not have hospital food | - |

| **X25.** Did you have access to hot drinks facilities in the hospital? (cross all that apply)[3] | |
|---|---|
| I used a kitchen area / parents room attached to the ward | 10 |
| I used a hospital café / vending machine | 10 |
| I was allowed to use the staff room | 10 |
| I was offered drinks by members of staff | 10 |
| No | 0 |

[3] The maximum score possible for question X25 was 10 even if a respondent was able to access hot drinks in a variety of ways.

| **X26.** Were you able to prepare food in the hospital if you wanted to? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not want to prepare food | - |

| **X28.** How would you rate the facilities for parents or carers staying overnight? | |
|---|---|
| Very good | 10 |
| Good | 7.5 |
| Fair | 5 |
| Poor | 2.5 |
| Very poor | 0 |

| **X29.** If your child felt pain while they were at the hospital, do you think staff did everything they could to help them? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| My child did not feel any pain | - |

| **X31.** Before your child had any operations or procedures did a member of staff explain to you what would be done? | |
|---|---|
| Yes, completely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not want an explanation | - |

| **X32.** Before the operations or procedures, did a member of staff answer your questions in a way you could understand? | |
|---|---|
| Yes, completely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not have any questions | - |

| **X33.** During any operations or procedures, did staff play with your child or do anything to distract them? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| It was not necessary | - |

| **X34.** Afterwards, did staff explain to you how the operations or procedures had gone? | |
|---|---|
| Yes, completely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| I did not want an explanation | - |

| **X36.** Were you given enough information about how your child should use the medicine(s) (e.g. when to take it, or whether it should be taken with food)? | |
|---|---|
| Yes, enough information | 10 |
| Some, but not enough | 5 |
| No information at all | 0 |

| **X37.** Did a staff member give you advice about caring for your child after you went home? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| It was not necessary | - |
| Don't know / can't remember | - |

| **X38.** Did a member of staff tell you who to talk to if you were worried about your child when you got home? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| It was not necessary | - |
| Don't know / can't remember | - |

| **X39.** When you left hospital, did you know what was going to happen next with your child's care? | |
|---|---|
| Yes, definitely | 10 |
| Yes, to some extent | 5 |
| No | 0 |
| It was not necessary | - |

| **X40.** Were you given any written information (such as leaflets) about your child's condition or treatment to take home with you? | |
|---|---|
| Yes | 10 |
| No, but I would have liked it | 0 |
| No, but I did not need it | - |

| **X41.** Do you feel that the people looking after your child listened to you? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X42.** Do you feel that the people looking after your child were friendly? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X43.** Do you feel that your child was well looked after by the hospital staff? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X44.** Do you feel that you (the parent/carer) were well looked after by hospital staff? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X45.** Were you treated with dignity and respect by the people looking after your child? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X46.** Overall... | |
|---|---|
| I felt my child had a very poor experience (0) | 0 |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |
| 4 | 4 |
| 5 | 5 |
| 6 | 6 |
| 7 | 7 |
| 8 | 8 |
| 9 | 9 |
| I felt that my child had a very good experience (10) | 10 |

| **X54.** Did hospital staff play with you or do any activities with you while you were in hospital? | |
|---|---|
| Yes, a lot | 10 |
| Yes, a little | 5 |
| No | 0 |
| I did not want or need them to | - |

| **X55.** Was the ward suitable for someone of your age? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X56.** Were there enough things for you to do in the hospital? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X57.** Did you like the hospital food? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| I did not have hospital food | - |

| **X58.** Was it quiet enough for you to sleep when needed in the hospital? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |
| I did not need to sleep in the hospital | - |

| **X59.** Did hospital staff talk with you about how they were going to care for you? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| Don't know / can't remember | - |

| **X60.** When the hospital staff spoke with you, did you understand what they said? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |
| Don't know / can't remember | - |

| **X61.** Did you feel able to ask staff questions? | |
|---|---|
| Yes | 10 |
| No | 0 |
| I did not have any questions | - |

| **X62.** Did the hospital staff answer your questions? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X63.** Were you involved in decisions about your care and treatment? | |
|---|---|
| Yes, a lot | 10 |
| Yes, a little | 5 |
| No | 0 |
| I did not want to be involved | - |

| **X64.** If you had any worries, did a member of staff talk with you about them? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| I did not want to talk to staff about any worries | - |

| **X65.** Were you given enough privacy when you were receiving care and treatment? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X66.** If you wanted, were you able to talk to a doctor or nurse without your parent or carer being there? | |
|---|---|
| Yes | 10 |
| No | 0 |
| I didn't want to talk to them alone | - |

| **X67.** If you felt pain while you were at the hospital, do you think staff did everything they could to help you? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| I did not feel any pain | - |

| **X69.** Before the operations or procedures, did hospital staff explain to you what would be done? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X70.** Afterwards, did staff explain to you how the operations or procedures had gone? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X71.** Did a member of staff tell you who to talk to if you were worried about anything when you got home? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| Don't know / can't remember | - |

| **X72.** When you left hospital, did you know what was going to happen next with your care? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |

| **X73.** Did a member of staff give you advice on how to look after yourself after you went home? | |
|---|---|
| Yes | 10 |
| Sort of | 5 |
| No | 0 |
| I did not need any advice | - |

| **X74.** Do you feel that the people looking after you were friendly? | |
|---|---|
| Yes, always | 10 |
| Yes, sometimes | 5 |
| No | 0 |

| **X75.** Overall, how well do you think you were looked after in hospital? | |
|---|---|
| Very well | 10 |
| Quite well | 7.5 |
| OK | 5 |
| Quite badly | 2.5 |
| Very badly | 0 |

# Appendix B: Calculating the trust score and category

## Calculating trust scores

The scores for each question were calculated using the method described below.

Weights were calculated to adjust for any variation between trusts that resulted from differences in the age group, length of stay and route of admission of respondents. A weight was calculated for each respondent by dividing the national proportion of respondents in their age group/ length of stay/ admission type by the corresponding trust proportion. The reason for weighting the data was that respondents may answer questions differently, depending on certain characteristics. If a trust had a large population of very young patients, their performance might be judged more harshly (or better) than if there was a more consistent distribution of patient ages across all trusts.

## Weighting survey responses

The first stage of the analysis involved calculating national age/ length of stay/ 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.

Age group is derived from the version of the questionnaire patients received: 0-7, 8-11 or 12-15. Length of stay is derived from sample information, with respondents grouped as 0 (zero overnight stays) or 1(one or more overnight stays).

Question X1 asked *"Was your child's visit to hospital planned or an emergency?"* Respondents that ticked *"Emergency (went to A&E/ Casualty/ came by ambulance etc)"* were classed as emergency patients for the purpose of the weightings. Those who ticked *"Planned visit / was on the waiting list"* were classed as elective patients. If respondents did not answer question X1, information was taken from sample information.

The national age/ length of stay/ admission method proportions relate to the proportion of emergency or elective admissions of different age groups who had a length of stay of either zero or more than one night.

As shown in Figure B1, the proportion of respondents who were admitted as emergencies, aged 8-11 and stayed for zero nights night is **0.040**; the proportion of respondents who were admitted as emergencies, aged 8-11 and stayed for more than one night is **0.050** etc.

**Figure B1 National Proportions**

| Admission Method | Length of stay | Age Group | National proportion 2016 |
|---|---|---|---|
| Emergency | Zero nights | 0-7 | 0.195 |
| | | 8-11 | 0.040 |
| | | 12-15 | 0.038 |
| | One night or more | 0-7 | 0.224 |
| | | 8-11 | 0.050 |
| | | 12-15 | 0.056 |
| Elective | Zero nights | 0-7 | 0.141 |
| | | 8-11 | 0.085 |
| | | 12-15 | 0.091 |
| | One night or more | 0-7 | 0.042 |
| | | 8-11 | 0.018 |
| | | 12-15 | 0.021 |

Note: All proportions are given to three decimals places for this example. The analysis included these figures to 14 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 group/ length of stay/ admission type weightings were calculated for each respondent by dividing the national proportion of respondents in their age group/ length of stay/ admission type by the corresponding trust proportion.

If, for example, a lower proportion of emergency patients aged 8-11 who spent zero nights in hospital 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. This increases the influence of responses made by respondents within that group in the final score, thus counteracting the low representation.

Likewise, if a considerably higher proportion of emergency patients aged 8-11 who spent one or more nights in hospital responded to the survey, in comparison with the national proportion, then this group would be over-represented in the final scores. Subsequently this group would have a greater influence over the final score. To counteract this, dividing the national proportion by the proportion for Trust A results in a weighting of less than one for this group.

**Figure B2 Proportion and Weighting for Trust A**

| Admission Method | Length of stay | Age Group | National proportion 2016 | Trust A Proportion | Trust A Weight (National/Trust A) |
|---|---|---|---|---|---|
| Emergency | Zero nights | 0-7 | 0.195 | 0.210 | 0.929 |
| | | 8-11 | 0.040 | 0.035 | 1.143 |
| | | 12-15 | 0.038 | 0.028 | 1.357 |
| | One night or more | 0-7 | 0.224 | 0.214 | 1.047 |
| | | 8-11 | 0.050 | 0.065 | 0.769 |
| | | 12-15 | 0.056 | 0.051 | 1.098 |
| Elective | Zero nights | 0-7 | 0.141 | 0.156 | 0.904 |
| | | 8-11 | 0.085 | 0.080 | 1.063 |
| | | 12-15 | 0.091 | 0.081 | 1.123 |
| | One night or more | 0-7 | 0.042 | 0.032 | 1.313 |
| | | 8-11 | 0.018 | 0.033 | 0.545 |
| | | 12-15 | 0.021 | 0.016 | 1.313 |

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 CQC 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 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 B3 Example scoring for the ‘Operations & procedures’ questions asked to children and young people aged 8-15, Trust A**

| Respondent | Scores | | Weight |
|---|---|---|---|
| | X69 | X70 | |
| 1 | 10 | 0 | 0.929 |
| 2 | 5 | 10 | 1.143 |
| 3 | . | 5 | 1.357 |

Respondents’ scores for each question were then multiplied individually by the relevant weighting, in order to obtain the numerators for the trust scores.

**Figure B4 Example numerators for the 'Operations & procedures' questions asked to children and young people aged 8-15, Trust A**

| Respondent | Scores | | Weight |
|---|---|---|---|
| | X69 | X70 | |
| 1 | 9.290 | 0 | 0.929 |
| 2 | 5.715 | 11.43 | 1.143 |
| 3 | | 6.785 | 1.357 |

## Obtaining the denominators for each domain score

A second dataset was then created. This contained a column for each question 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 B5 Example values for non-missing responses, 'Operations and procedures' questions asked to children and young people aged 8-15, Trust A**

| Respondent | Scores | | Weight |
|---|---|---|---|
| | X69 | X70 | |
| 1 | 1 | 1 | 0.929 |
| 2 | 1 | 1 | 1.143 |
| 3 | | 1 | 1.357 |

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. 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 B6 Denominators for the 'Operations & procedures' questions asked to children & young people aged 8-15, Trust A**

| Respondent | Score | | Weight |
|---|---|---|---|
| | X69 | X70 | |
| 1 | 0.929 | 0.929 | 0.929 |
| 2 | 1.143 | 1.143 | 1.143 |
| 3 | | 1.357 | 1.357 |

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 A, we calculated weighted mean scores for each question.

X69: $\frac{9.290 + 5.715}{0.929 + 1.143} = 7.242$

X70: $\frac{0.000 + 11.43 + 6.785}{0.929 + 1.143 + 1.357} = 5.312$

This process is followed for each scored question within the survey.

## Calculation of the expected ranges

Z statistics (or Z scores) are standard 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[4],
$y_i$ is the trust score
$\theta_0$ is the mean score for all trusts

Under this banding scheme, a trust with a Z score of < -1.96 is labeled as "Worse", -1.96 < Z < 1.96 as "About the same", and Z > 1.96 as "Better" than what would be expected based on the national distribution of trust scores.

However, for measures where there is a high level of precision 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.

[4] Calculated using the method in Appendix C.

The steps taken to calculate $Z_D$ scores 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 $Z_{(1-q)}$. 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 $\theta_i$ (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:

$$\boldsymbol{Z}_i^D = \frac{y_i - \theta_0}{\sqrt{\boldsymbol{S}_i^2 + \hat{\tau}^2}} \quad (4)$$

# Appendix C: Calculation of standard errors

## Calculation of standard errors

In order to calculate statistical bandings from the data, it is necessary for CQC to have trusts' scores for each question and the associated standard error.

For the patient experience surveys, these are then used to calculate the z-scores for each question of interest.

## 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*

$w_{ij}$ is the standardization weight calculated for respondent *j* in trust *i*

$Y_{ik}$ is the overall trust *i* score for question *k*

Associated with the subject or respondent is a weight $w_{ij}$ corresponding to how well the respondent's age/ length of stay/ admission method 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:

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

## Calculating standard errors

Standard errors are calculated for 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:

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

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

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