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**Issues paper**

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This document presents the results and trends from an analysis of the first nine years of data from the National Student Survey (NSS). The two main areas of investigation are the robustness of the NSS results, which is considered by investigating response patterns, and the difference between the NSS results split by a variety of student and course characteristics such as ethnicity, gender and subject.

# UK review of the provision of information about higher education

## **National Student Survey results and trends analysis 2005-2013**

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# UK review of the provision of information about higher education: National Student Survey results and trends analysis 2005-2013

To	Heads of UK publicly funded higher education institutions Heads of HEFCE-funded further education colleges Heads of HEFCW-funded further education institutions
Of interest to those responsible for	Quality assurance and enhancement, Student services and Planning practitioners
Reference	2014/13
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Enquiries to	Emily Thorn, tel 0117 9317268, e-mail <a href="mailto:e.thorn@hefce.ac.uk">e.thorn@hefce.ac.uk</a>

## Executive summary

### Purpose

1. This document presents the results and trends from an analysis of the first nine years of data from the National Student Survey (NSS). The two main areas of investigation are the robustness of the NSS results, which is considered by investigating response patterns, and the difference between the NSS results split by a variety of student and course characteristics such as ethnicity, gender and subject.

### Key points

#### Robustness of the results

##### The NSS question scales are valid across all years of the NSS

2. The National Student Survey (NSS) originally contained 22 questions which were split into six sets of questions, also known as NSS question scales. These six scales were:

- Teaching and learning
- Assessment and feedback
- Academic support
- Organisation and management
- Learning resources
- Personal development.

3. There is an additional standalone question regarding overall satisfaction.

4. Statistical methods can be used to determine whether the individual NSS questions can be grouped into related sets of questions. This analysis of the responses indicates that the individual questions cluster into the same groups as the NSS question scales listed in paragraph 2. Hence the way in which the questions were originally grouped

formed a solid structure for the survey which has remained consistent over the nine years of the NSS.

**When presenting results, 'definitely agree' and 'mostly agree' can be combined as a measure of satisfaction. However, 'definitely disagree' and 'mostly disagree' should not be combined as a measure of dissatisfaction**

5. Response patterns of related questions differ more depending on whether 'definitely disagree' or 'mostly disagree' is the chosen response, compared with those who choose 'definitely agree' or 'mostly agree'. This suggests that the results for 'neither agree nor disagree', 'mostly disagree' and 'definitely disagree' should be presented as separate percentages.

**The questions have become more similarly answered over time**

6. The relationship in the responses between individual questions in the NSS has become stronger over time. This means that the responses to individual questions are more similar in 2013 than they were in 2005.

7. There are close relationships between the response to the overall satisfaction question and the responses to the individual questions. These relationships suggest that all the responses to the questions reflect the overall satisfaction of students.

**Over 5 per cent of respondents tick the same answer for every question**

8. The act of choosing the same answer to every question is known as acquiescence bias or yea-saying. In 2005 only 1.0 per cent of respondents were found to be yea-saying, but by 2013 this had risen to 5.4 per cent. This is much higher than would be expected, even after accounting for the very high levels of satisfaction and strong relationship between the answers to different questions.

9. The vast majority of yea-saying occurs with respondents choosing the 'definitely agree' response category.

10. There is no indication of any link between the incentives or prizes offered by institutions to their students for completing the survey and the proportion of yea-saying. There is also no relationship between the size of an institution and the proportion of yea-saying.

11. We have tested the impact of yea-saying on the NSS results by removing all responses with identical answers to every question from the analysis, and have found no material difference in the sector results. However, if the proportion of yea-saying continues to rise, there is a possibility that it could affect the robustness of the NSS results.

**Online responses are the most similar**

12. When the responses are split by the three survey completion methods (online, postal and phone), the strongest relationship between responses to the questions is found in the online responses. In other words, the responses of any given individual are most similar when responding online.

13. Yea-saying is present in responses amongst all completion methods, but most predominant in online responses. When yea-sayers are removed from the data, the results of the analysis in paragraph 13 still hold true.

### **Student satisfaction**

#### **Students have become more satisfied over time**

14. The percentage of students who agree with each of the six NSS question scales and the overall satisfaction question has increased over time.

#### **Black Caribbean students are less satisfied than the average, but Black African students are more satisfied**

15. The 'overall satisfaction' of Black Caribbean students has always been lower compared with White students. An expected 'overall satisfaction' score for different student characteristics can be generated by modelling the NSS results. The largest difference between this and the actual score for 'overall satisfaction' from Black Caribbean students was seen in 2011, when the satisfaction score for Black Caribbean students was 73.6 per cent compared with the expected satisfaction score of 80.1 per cent. Black Caribbean students were therefore 6.5 percentage points less satisfied than expected in 2011.

16. Conversely, the proportion of Black African students who agree with the overall satisfaction question is higher compared with White students. This difference peaked in 2010, when Black African students had an expected 'overall satisfaction' score of 79.7 and an actual 'overall satisfaction' score of 83.3. Hence, in 2010, Black African students were 3.6 percentage points more satisfied than expected.

#### **The largest variation in satisfaction scores is observed when considering subject of study**

17. By far the biggest variation in satisfaction is between subjects of study. The results of modelling 2013 'overall satisfaction' are spread across a range of more than 15 percentage points when split by subject.

#### **Students who declare a disability are less satisfied than those with no known disability**

18. Across the five years of modelled overall satisfaction results, those with a declared disability have been consistently less satisfied than those with no known disability.

#### **Action required**

19. In addition to this report, there is an opportunity to explore the NSS data further using an online NSS tool which can be found at [www.hefce.ac.uk/whatwedo/lt/publicinfo/nss/nsstrend/](http://www.hefce.ac.uk/whatwedo/lt/publicinfo/nss/nsstrend/). The online tool contains data from all nine years of the NSS, and allows investigation of the results split by a variety of student characteristics (such as age, gender and ethnicity).

20. Over the course of the NSS we have had over 2 million responses which have been linked back to the student characteristics of individual respondents.

## **Background**

21. The National Student Survey (NSS) was introduced in 2005 primarily for students in their final year of study. Ipsos MORI has conducted the NSS on behalf of its funders since 2005.

22. In 2012 a new question was introduced to the survey which asked students about their students' union (or association or guild). Since this was not included in the original survey it has been excluded from the analysis in this report.

23. In 2005 it was compulsory for institutions to invite students registered at English, Welsh and Northern Irish higher education institutions (HEIs) who were not funded by the NHS to complete the NSS. Several other groups of students have since been included in the survey population, such as those studying NHS-funded courses and those registered at Scottish HEIs, English further education colleges and Welsh further education institutions.

24. In order to present consistent and comparable results, any longitudinal analysis will be performed on the core population of students who have been part of the survey cohort since the beginning: those registered at English, Welsh or Northern Irish HEIs who are not NHS-funded.

## **Robustness of the results**

25. Any successful survey requires solid foundations. This section identifies areas of robustness and of potential for improvement in the National Student Survey (NSS). The robustness has been tested using a variety of statistical techniques to investigate the survey structure and the relationship between the questions and the responses.

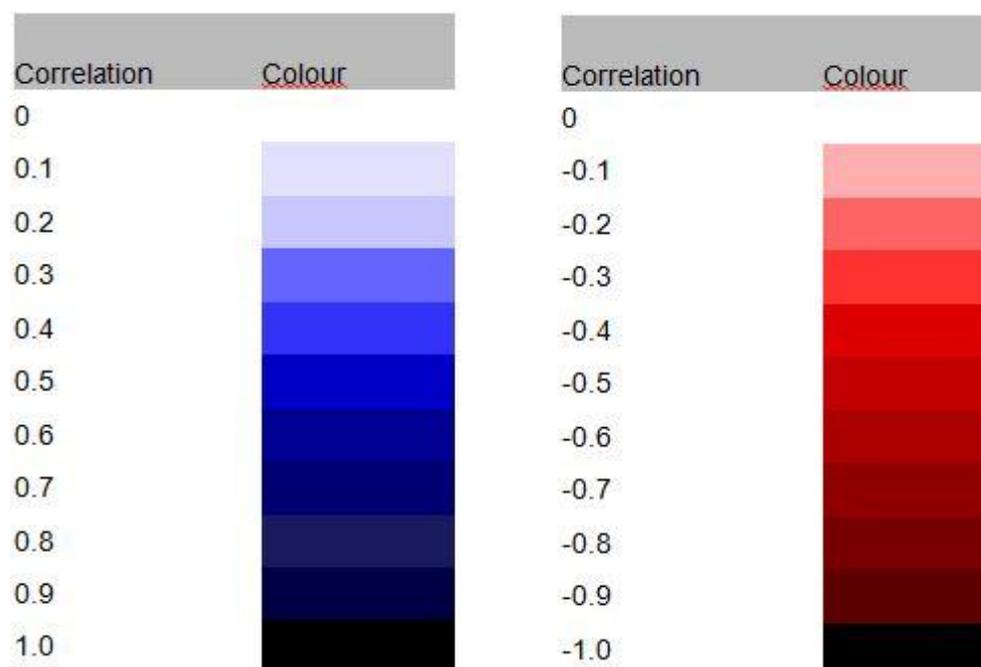
26. Explanations of the techniques used and the consequent results are presented throughout this section, with more detailed explanations provided in Annex A.

## **Heat maps**

27. Some results in this section are presented as heat maps where different colours represent different levels of correlation. The figures that have been used to produce the heat maps are in Annexes E.

28. Blue and red represent positive and negative correlation respectively, and a darker shade indicates a stronger correlation. Figure 1 displays the key that is used to shade the correlations. For example, if every single student who completed the survey gave the same answer to two questions, the correlation between those questions would be 1, and would be represented by the very dark shade of blue shown in Figure 1. For a more detailed explanation about correlation and the colours shown, see [paragraphs 16 to 27 of Annex A](#).

**Figure 1: Key for correlation in heat maps**



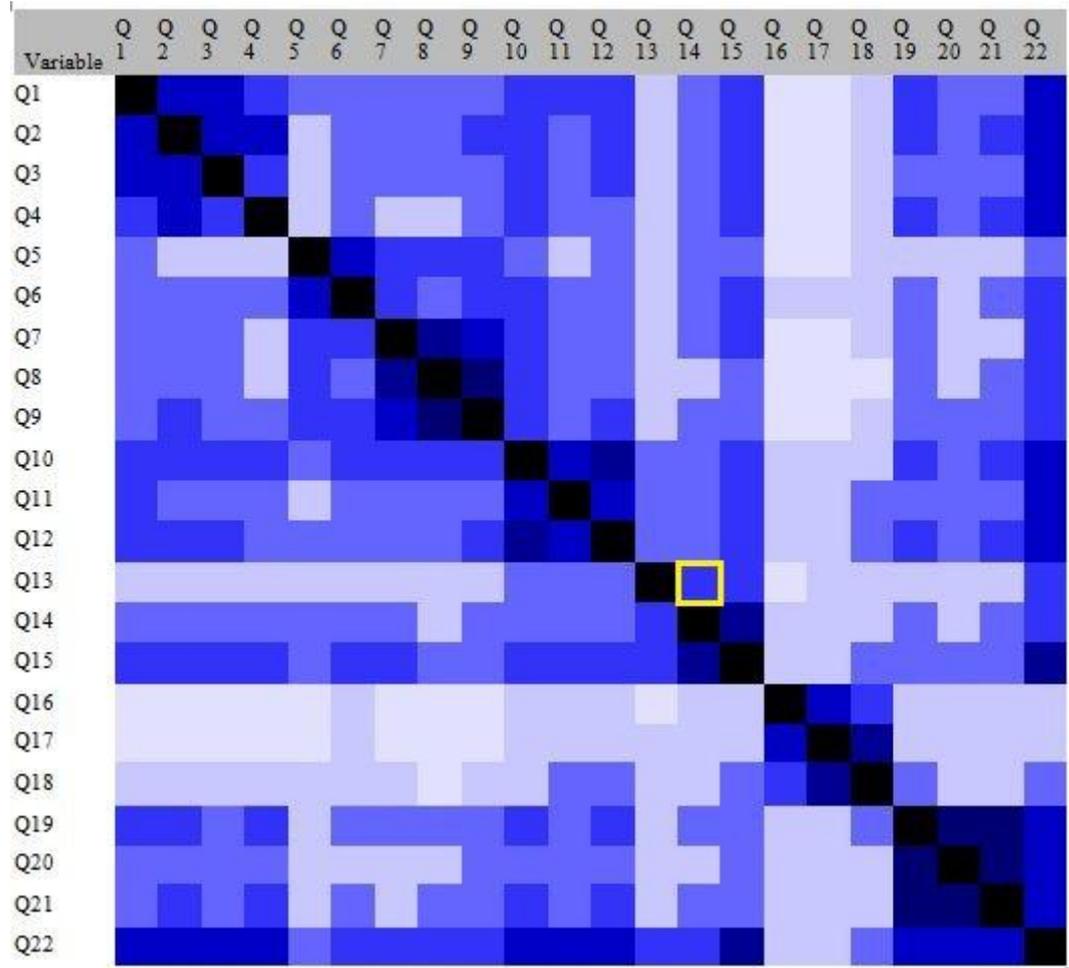
### **Correlation matrices**

29. A correlation matrix can, in this context, be used to look at how similarly two questions have been answered. The relationship between the responses to two questions may be important in the wider NSS context. For example, if two questions are responded to very similarly, and the questions appear to be asking similar questions, then if the length of the questionnaire were considered an issue the relationship between the responses might be an argument for removing one of the questions from the survey. Alternatively, one of the questions could be reworded negatively as a way of detecting yea-saying.

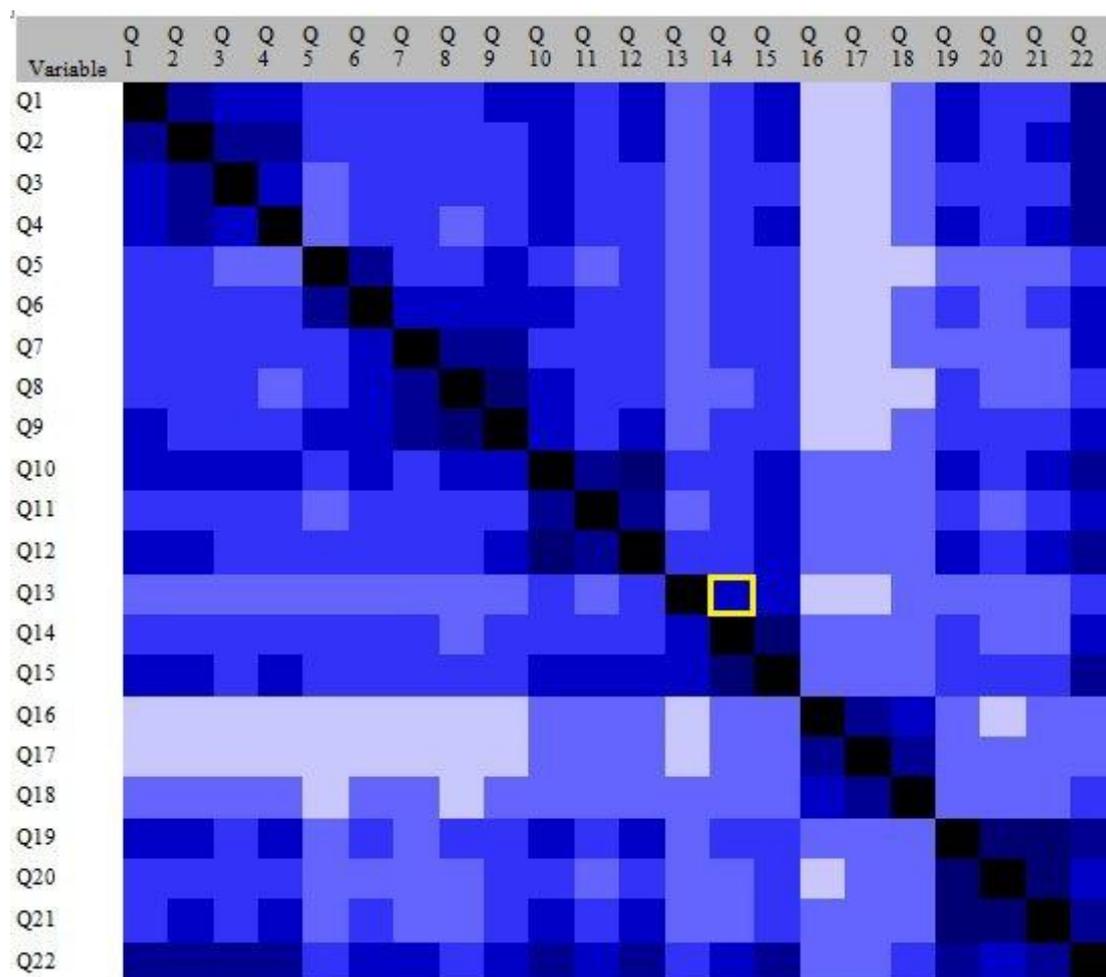
30. Conversely, if there are two questions which seemingly ask the same thing but whose responses appear to be completely unrelated, further investigation might be required into issues relating to students' interpretations of the two questions.

31. Figures 2 and 3 show heat maps of the correlation between responses to questions for the 2005 and 2013 NSS results respectively.

**Figure 2: Heat map of the correlation between the responses to the NSS questions for the 2005 results**



**Figure 3: Heat map of the correlation between the responses to the NSS questions for the 2013 results**



32. Comparison of the two heat maps clearly identifies darker shades of blue in Figure 3 for all pairs of questions, implying a closer similarity between the responses to each pair of questions in 2013 than 2005. (See, for example, the square representing the relationship between questions 13 and 14, highlighted with a yellow border. The darker shade means that there was a stronger relationship between the responses to these questions in 2013 than in 2005.)

33. The increase in correlation between questions has been gradual over time. Full results can be found in Annexes C and E.

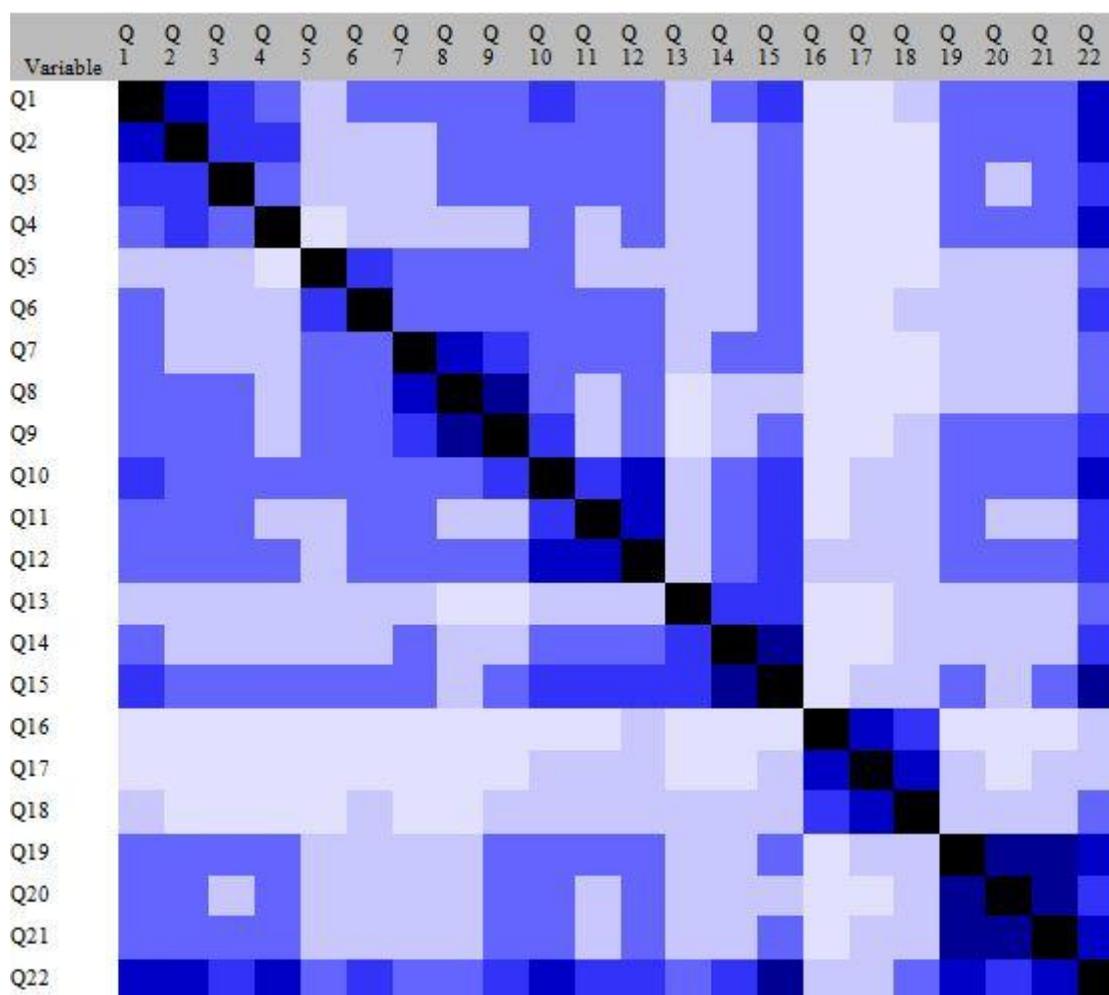
34. There was a slight dip in some correlations between the 2008 and 2009 NSS. It is not possible to say definitely why, but the 2009 NSS population would have included the first graduates from three-year courses who paid £3,000 fees, which were introduced in the 2006-07 academic year.

## Method of response

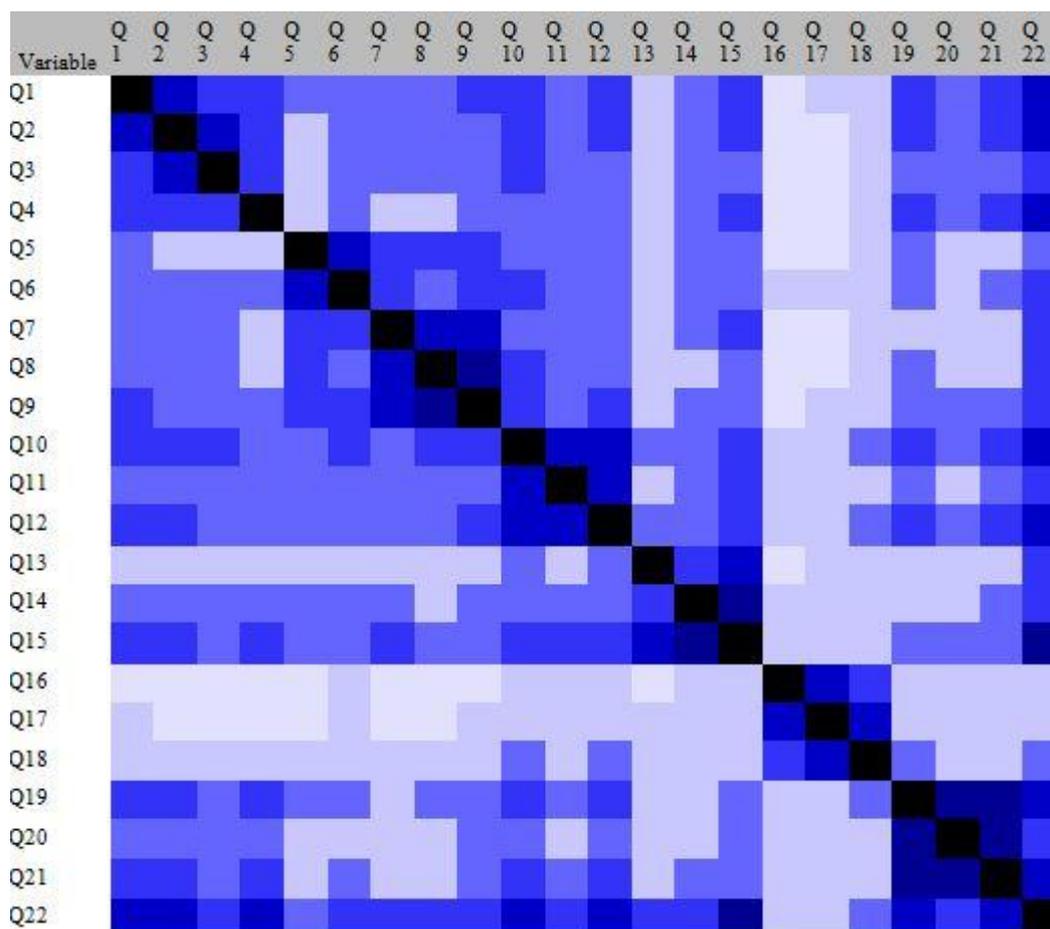
35. Individuals can respond to the NSS online, by phone or by post. Online responses have increased, from 32 to 71 per cent, between 2005 and 2013. This increase corresponds with declines in postal and phone responses of 19 and 20 percentage points respectively.

36. The increases in correlation over the lifetime of the NSS, as shown in the previous section, hold across all methods of response. This is demonstrated in Figures 4 and 5, which show the heat maps for phone respondents for 2005 and 2013. Despite the increase in correlation across all method of response, the data indicate that online responses are more highly correlated than phone responses; postal response correlations lie somewhere between the two. The correlation matrices and heat maps for other years split by method of response can be found in Annexes D and F.

**Figure 4: Heat map of correlation matrix for phone responses from the 2005 NSS**



**Figure 5: Heat map of correlation matrix for phone responses from the 2013 NSS**



37. Over the nine years of the NSS there has been an increase in correlation between the NSS questions and there has also been a large increase in the number of online respondents. Additionally online respondents see the largest correlation between questions of all of the methods of response.

38. Different methods of response often produce different types of responses. Therefore a big shift in the method by which individuals respond to the NSS raised concern that perhaps the questions were only more correlated due to a shift in response patterns rather than because the relationship between the questions was getting stronger.

39. To determine whether this concern is a reality it is possible to estimate how far the increased correlation between the NSS questions can be attributed to the change in response profile. To do this the 2005 NSS results were re-weighted to have the same response pattern as the 2013 NSS results. This allowed a comparison between the correlations in the 2013 and the re-weighted 2005 NSS results.

40. The results show that only 16.3 per cent of the increased correlation is accounted for by the changes in how individuals respond to the survey. Therefore the relationship between the questions is getting stronger, regardless of changes to the response profile.

41. Unfortunately it is not possible to say exactly what is responsible for the other 83.7 per cent of the increase in the correlation between questions. However, possible contributing factors could be institutions addressing areas of weakness in their NSS results, and respondents ticking the same answer for all questions (yea-saying).

### **Principal component analysis**

42. Principal component analysis can be used to determine whether a set of variables has a strong enough relationship with one another to be split into fewer related groups, known as 'factors' or 'principal components'. For an introduction to principal component analysis see [Annex A paragraphs 28 to 36](#).

43. A principal component analysis of the 2013 NSS results suggests that it would be reasonable to set the number of factors at five, six or seven.

44. As outlined in the 2005 report 'National Student Survey: interim assessment of the 2005 questionnaire' (Richardson 2005), if six factors are used then each of the six principal components represents a different NSS question scale<sup>1</sup>. This is not surprising, given that each scale represents a particular theme of questions.

45. If seven principal components are considered, five of the scales are unchanged with the remaining scale, 'assessment and feedback', split between the assessment questions and the feedback questions. This result can be seen in the heat map for the 2013 NSS results in Figure 6.

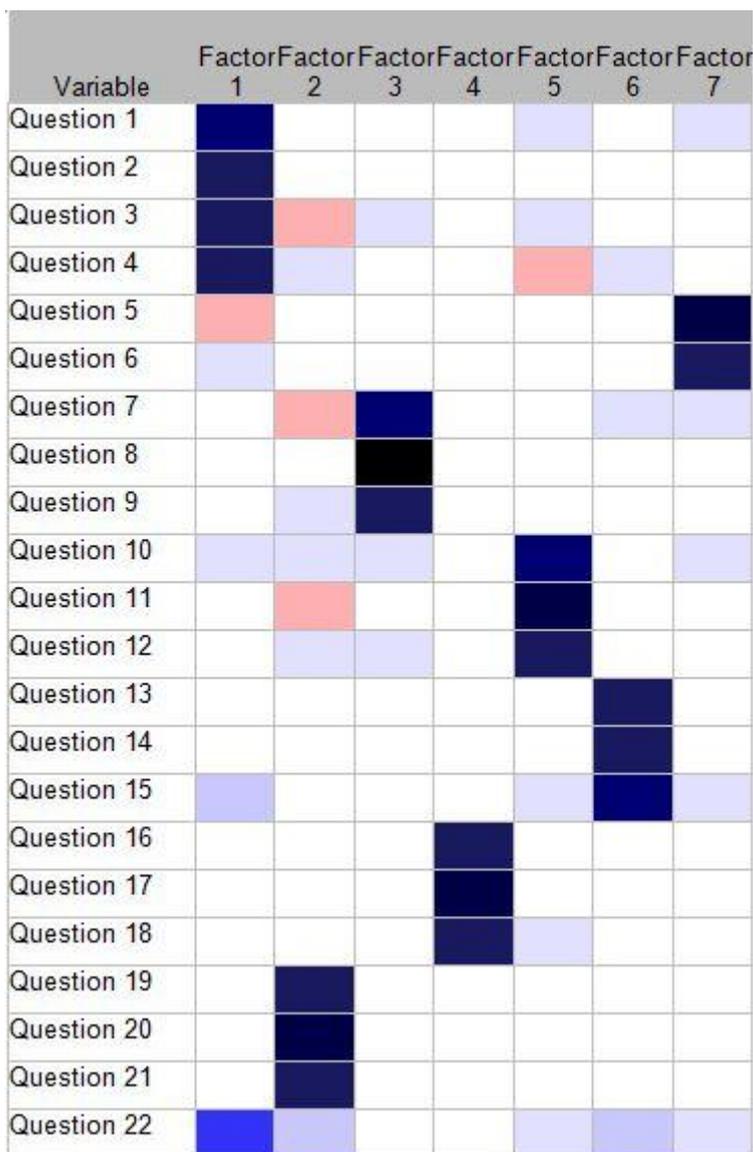
46. It is clear from Figure 6 that Factor 1, which appears to represent the 'teaching and learning' scale, is related most closely to overall satisfaction (demonstrated by the darkest shade of blue in the question 22 row). This suggests that the 'teaching and learning' responses are most indicative of the overall satisfaction result.

47. The results from the principal component analysis are consistent over all years of the NSS. This implies that the six NSS question scales that were used to group the questions during the creation of the NSS have provided a good structure for the survey and remained relevant over its lifetime. The heat maps for all years can be found in Annex G and the underlying data can be found in Annex L.

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<sup>1</sup> For works cited in this report, see Annex B: Bibliography.

**Figure 6: Heat map of results from a principal component analysis on the 2013 NSS results**

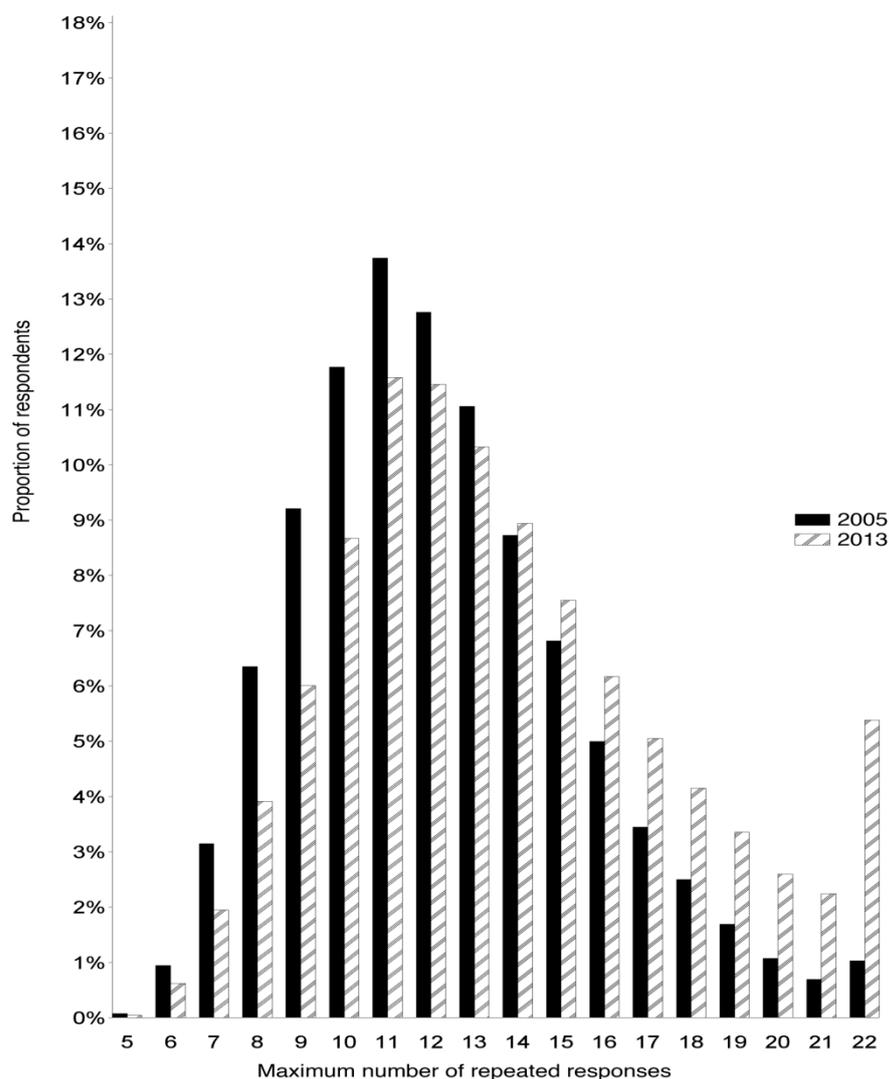


### Yea-saying

48. Yea-saying is the name given to the scenario where an individual provides the same response to all of the questions in the survey. Obviously some respondents might reasonably want to provide the same answer to all 22 questions, but the proportion doing so would be expected to be low.

49. The maximum number of repeated responses can be determined if the number of times each response category ('definitely agree', 'agree' etc. and so on) is chosen is summed and the maximum value taken. For example if a respondent chose 'agree' for nine questions, 'definitely agree' for ten questions and 'definitely disagree' for three questions then the maximum number of repeated responses would be 10. Since there are 22 questions in the NSS, the maximum possible number of repeated responses for yea-sayers is 22. The proportion of respondents across the possible maximum numbers of repeated responses for the 2005 and 2013 NSS results is shown in Figure 7.

**Figure 7: Proportions of respondents by maximum number of repeated responses**

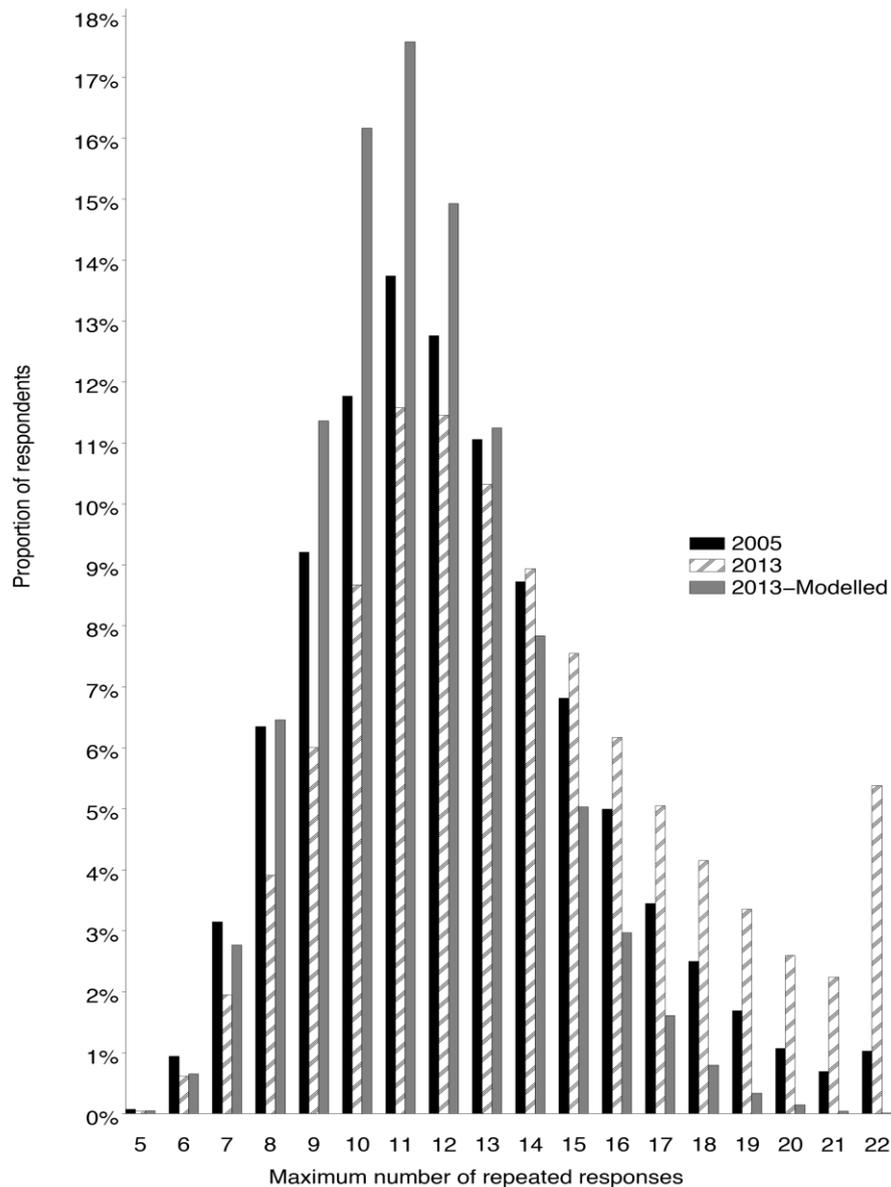


50. Figure 7 shows a clear increase in the proportion of respondents answering 14 or more questions with the same response between 2005 and 2013. This is particularly striking for those giving exactly the same response to every question.

51. In 2005, 1 per cent of respondents gave the same answer to all 22 questions. That proportion has increased by 4.4 percentage points over the nine years to 5.4 per cent. This means that in 2013 over 1 in 20 respondents chose the same answer to every question in the survey.

52. This level of yea-saying is fairly high, although some yea-saying might be expected given the very high correlation between the NSS questions. To test the extent to which the level of yea-saying observed was to be expected, a simulated set of NSS responses was generated using the correlation between the questions observed in the 2013 NSS results. The generated NSS results showed that the proportion of yea-saying that would be expected would be less than 0.1 per cent. These results can be seen in Figure 8.

**Figure 8: Proportion of yea-saying for the 2005 and 2013 NSS results and the simulated NSS results**

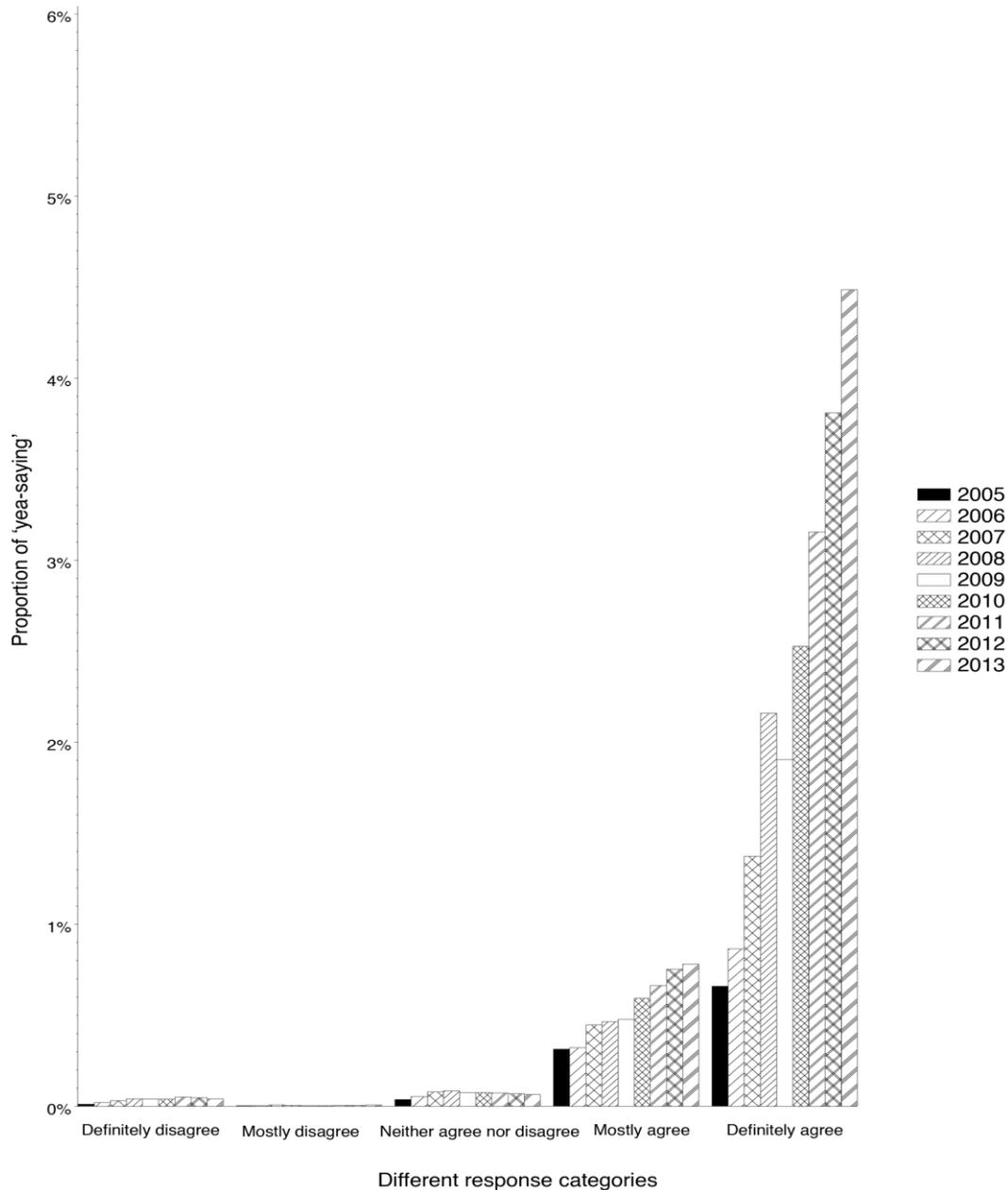


53. By far the most common response chosen for yea-sayers is ‘definitely agree’. The proportion of yea-saying that occurs in each response category across the lifetime of the NSS is shown in Figure 9.

54. The proportion of yea-saying in the ‘definitely agree’ category has increased by 3.8 percentage points between 2005 (0.7 per cent) and 2013 (4.5 per cent). The second most common response category for yea-saying is ‘mostly agree’ and its usage has increased from 0.3 per cent to 0.8 per cent of respondents between 2005 and 2013.

55. The response category ‘mostly disagree’ shows a negligible amount of yea-saying in all years and is least commonly used.

**Figure 9: Proportion of yea-saying for each response category out of the total number of respondents**



56. The proportion of yea-saying in individual institutions for the 2013 survey varies greatly, from a minimum of 0.5 per cent to a maximum of 45.7 per cent. There is no apparent relationship between the size of an institution and the proportion of yea-saying. However, the eight institutions where more than 20 per cent of the respondents are yea-sayers are all relatively small: they each have a total number of responses to the 2013 NSS of fewer than 200.

57. Yea-saying occurs regardless of the type of prizes or incentives, if any, that institutions offer their students for completing the survey. There is no indication of any link between such incentives or prizes and the proportion of yea-saying.

58. If the proportion of yea-saying continues to rise then it could potentially affect the robustness of the NSS results.

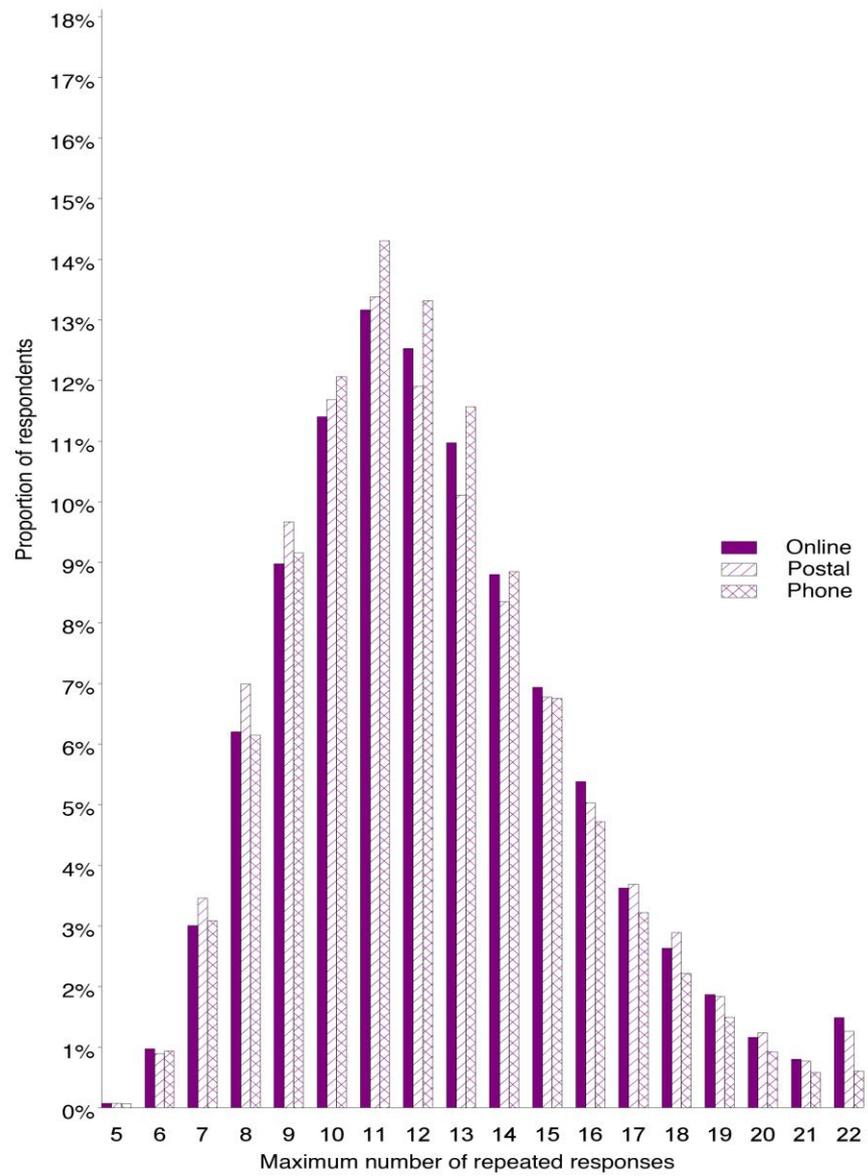
59. However, there is currently no way of knowing whether the high proportion of yea-saying, particularly in the 'definitely agree' response category, is genuine or related to a lack of engagement when completing the survey.

60. A possible way to determine this could be to use one or more pairs of questions with a strong relationship, and present one so that it is positively worded and the other so that it is negatively worded. Given the strong relationship, one would expect that if the positively worded question in a pair were answered 'definitely agree' then the negatively worded question would normally be answered 'definitely disagree'. If both questions elicited the same response it would suggest that the respondent was not fully engaged when completing the survey. This could indicate that their response was not valid.

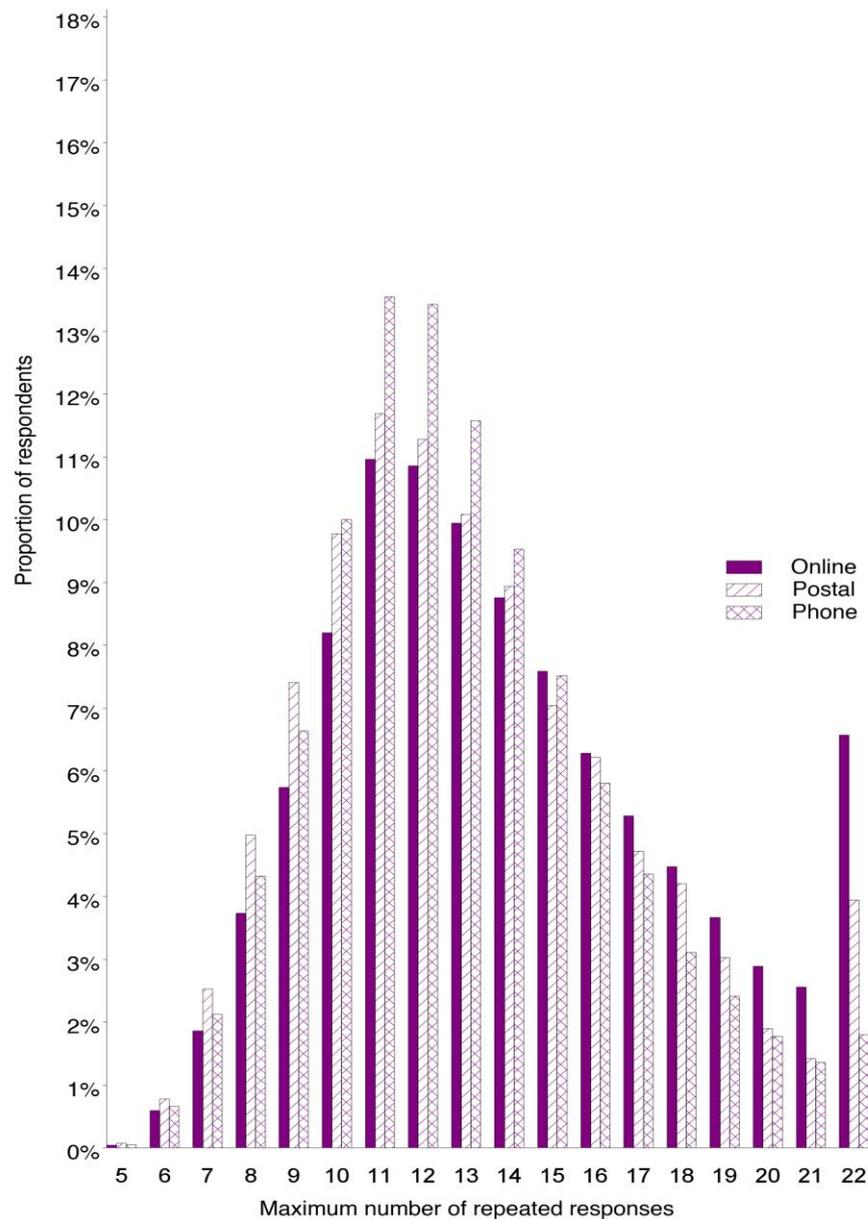
61. How the results of respondents in this category would be treated would need to be considered further, but this would at least provide a mechanism to measure lack of engagement when completing the questionnaire, which we are currently unable to identify.

62. Although online responses are the predominant source, yea-saying has increased across all methods of response throughout the lifetime of the survey. The proportions of yea-saying split by method of response for 2005 and 2013 can be seen in Figures 10 and 11 respectively. The two figures clearly demonstrate that a higher proportion of respondents are answering the NSS questions more similarly in 2013 than in 2005, across all methods of response.

**Figure 10: Maximum number of repeated responses split by method of response for the 2005 NSS**



**Figure 11: Maximum number of repeated responses split by method of response for the 2013 NSS**



63. If online response times were available, these could be used as another mechanism for detecting to what extent students have engaged. If a student has responded to all of the questions much more quickly than expected, this might signal a lack of engagement with the survey.

**Ordering of the response categories**

64. Currently the NSS response categories as presented to respondents range from ‘definitely agree’ on the left through to ‘definitely disagree’, and finally ‘not applicable’, on the far right.

65. A small study (Friedman 1994) indicates that there is a response bias towards the left side of such a scale. This test was performed on students at an American college,

asking them to rate their level of satisfaction with certain aspects of the college. The study concluded that:

*'...subjects were more likely to agree with the...statements when the response category of "strongly agree" was on the left side (the beginning of the scale) rather than when it appeared on the right side of the page (the end of the scale).'*

66. The study also tested the effect of having phrases worded favourably and unfavourably. (For example, a favourably worded phrase might take the form 'Staff are good at explaining things', while an unfavourable phrase could be 'Staff are bad at explaining things').

67. The results of the study reported that:

*'...the students, for the most part, held positive attitudes towards their college. It seems that with favourable items, subjects had a greater tendency to check the left side of the scale to show their agreement than to check the right side of the scale to indicate agreement. With the unfavourable items – items with which most of the students were going to disagree – it apparently did not seem to make a difference whether the "disagree" categories were placed on the right or left side of the scale.'*<sup>2</sup>

68. From this study it appears that a response scale ranging from 'definitely agree' on the left through to 'definitely disagree' on the right encourages more positive responses, which are further encouraged by favourably worded questions. Currently the NSS uses both favourably worded questions and a response scale that becomes less positive as respondents read across the page.

69. Given the high level of yea-saying in the NSS questions, and the response bias discovered by Friedman 1994, it would be worth considering the ordering of the scale and the wording of the questions when piloting a revised NSS.

70. Changing the wording from positive to negative in some of the questions would risk causing confusion for the respondents and thereby reducing the robustness of the results. The consistency of the responses to positively and negatively worded questions would need to be tested rigorously during piloting.

### **Grouping response categories**

71. NSS results are commonly presented using one of the two methods explained below.

a. The average score method assigns each NSS response a number – 1 for 'definitely disagree' through to 5 for 'definitely agree' – and then works out the average score for each question.

b. The percentage of students who agree with any given question is the proportion of respondents who choose either 'mostly agree' or 'definitely agree'.

72. The NSS uses a version of the Likert scale which was first invented in 1932 by Rensis Likert for the purpose of measuring behaviours or attitudes.

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<sup>2</sup> Note that in this quote 'check' is used to mean 'tick'.

73. As outlined by Boone 2012, it is not possible to tell how much more or less satisfied an individual is when responding to single questions. In other words each individual's interpretation of satisfaction can differ and this cannot be accounted for in the data. For this reason, each of the different response categories should be treated separately, and not as if the relationships between each category can be predicted.

*'Numbers assigned to Likert-type items express a "greater than" relationship; however, how much greater than is not implied. Because of these conditions, Likert-type items fall into the ordinal measurement scale.'*

74. It cannot be assumed, therefore, that the difference in satisfaction between 'definitely disagree' and 'mostly disagree' is the same as the difference in satisfaction between 'definitely agree' and 'mostly agree'.

75. For the analysis in this report, the NSS results will therefore be treated as individual Likert type items. This means that the results will not be assigned numbers as in method a. described above. Instead it is necessary to consider whether either a single response options or a group of them will be used to report the satisfaction or dissatisfaction of students.

**Table 1: Proportion of respondents who agreed or disagreed in response to question 1 by response to question 2**

	Question 1: either 'mostly disagree' or 'definitely disagree'	Question 1: either 'mostly agree' or 'definitely agree'
Question 2: 'definitely disagree'	68.8%	19.6%
Question 2: 'mostly disagree'	32.2%	46.1%
Question 2: 'mostly agree'	1.7%	94.4%
Question 2: 'definitely agree'	0.3%	99.2%

76. Table 1 shows that the proportion of respondents who selected 'mostly agree' in response to question 2, after choosing either 'mostly agree' or 'definitely agree' for question 1, was 94.4 per cent. Of those who responded 'definitely agree' to question 2, the proportion who responded either 'mostly agree' or 'definitely agree' to question 1 is 99.2 per cent. These proportions are fairly similar, and seemingly show that 'mostly agree' and 'definitely agree' could be combined into an 'agree' category which could be used as a measure of satisfaction.

77. As also demonstrated by Table 1, for those who responded with 'mostly disagree' and 'definitely disagree' to question 2, the proportions who responded with 'definitely disagree' or 'mostly disagree' to question 1 are 32.2 per cent and 68.8 per cent respectively. These dissimilar proportions indicate that 'definitely disagree' and 'mostly disagree' are not used similarly. It would not therefore be reasonable to group 'definitely disagree' and 'mostly disagree' into a single 'disagree' category. Instead, the single 'definitely disagree' category can be used a measure of dissatisfaction.

78. So, while it is safe to group the 'mostly agree' and 'definitely agree' categories into a measure for satisfaction, it is not safe to do the same for dissatisfaction. When presenting the results from the NSS, care must be taken to ensure that the 'disagree' response categories are not incorrectly grouped together. When representing percentages, it would be reasonable to group 'definitely agree' and 'mostly agree' together, while reporting the other three categories ('neither agree nor disagree', 'mostly disagree' and 'definitely disagree') separately.

79. Therefore the model used in this study will combine those who responded 'definitely agree' and 'mostly agree' when measuring satisfaction. When considering dissatisfaction, the model will take those who responded 'definitely disagree' as the response variable of interest.

### **The model**

80. This section explains the type of model that has been used for analysis in this report. The results from the previous sections and the structure of the data have been taken into account in this choice. For more information about how the results from the model have been interpreted, see [Annex A paragraphs 40 to 43](#).

81. A logistic regression model requires data to be split into binary form. The NSS results can be analysed in two clear groups, measuring satisfaction and dissatisfaction meaning that logistic regression is an appropriate form of model given the structure of the NSS data.

82. It is reasonable to assume that, even having accounted for student and course characteristics, the NSS results will vary between institutions. To account for this variation, a multi-level logistic regression model will be used. This allows characteristic effects, such as ethnicity, gender or age, to be identified separately from institutional effects. For more information about the structure of the multi-level logistic regression model, see [Annex A paragraphs 37 to 39](#).

83. To calculate whether an individual agrees with an entire NSS question scale, an average is required. Given that logistic regression depends on the data being split into two distinct groups, it is not possible to model these averages. Therefore, to analyse the results of the entire survey, each question is modelled separately.

84. The model has been built based on the overall satisfaction question, and the following variables are accounted for within the model:

- age on entry
- ethnicity
- disability status
- domicile
- qualification on entry
- level of study
- mode of study
- method of response

- Participation of Local Areas (POLAR) version 3 score
- Subject level 2, based on the Joint Academic Coding System (JACS)
- whether or not a student's study is franchised
- time in days taken to respond to the survey
- state or Independent school
- gender.

85. The way in which the results for two variables relate to each other is known as a two-way interaction. Two-way interactions are important as they allow the NSS results to be considered at an increased level of detail.

86. For example, to consider the relationship between gender and age group, one two-way interaction would be between males and those who are in the 21 to 24 age group. Modelling that two-way interaction makes it possible to calculate how much more or less satisfied 21- to 24-year-old males are.

87. The two-way interactions between the variables listed in paragraph 84, with the exception of any interactions involving entry qualifications or subject, have also been included in the model where they were statistically significant.

88. When considering modelling results, there always needs to be a group that is used as a base or control group for comparison. Base groups have been chosen either because they form by far the largest population (for example, White students are the base group when considering ethnicity) or because the overall satisfaction results for that group lie in the middle of the satisfaction results for the characteristic.

89. Computer science is the base group when considering subject. Thus any modelling results for subject will always compared with those of students studying Computer science. The base groups will be clarified when the different modelling results are considered, and are also shown in Table 2.

**Table 2: Base groups used during the modelling process**

<b>Characteristic</b>	<b>Base group</b>
Age	Under 21
Ethnicity	White
Disability status	No known disability
Domicile	UK-domiciled
Qualification on entry	Tariff points
Level of study	First degree
Method of response	Online
POLAR3	Quintile 5
Subject (JACS level 2)	Computer science
Franchised out indicator	Not franchised out
Previous school type	State school
Gender	Female
Time in days taken to respond to the survey	1 to 14 days

90. Nearly all of the characteristics used in the model have a statistically significant effect on the NSS results in relation to the base group for each category<sup>3</sup>. Since there are a large number of statistically significant variables, the concept of ‘material difference’ can be used to determine which differences are more important.

91. Whether or not the differences between the results are material depends on the circumstances around why the results are being investigated, and a certain amount of judgement is required. For this report, to provide results covering a wide range of characteristics without listing too many individual statistics, a difference of two percentage points above or below the average will be considered material. (However, all of the results can be found in the annexes H, I and J.)

### **Satisfaction of the full-time core population**

92. The core population consists of students who have been involved in every year of the survey. The core population is all those who are registered at English, Welsh and Northern Irish higher education institutions (HEIs) who are not NHS-funded. Welsh NHS students are not included in the core population, despite being part of the NSS since the beginning, because comparable students from the other regions of the UK were not included in the original NSS population. Students registered at Scottish HEIs are not included in time-series analysis, since not all of the Scottish institutions have taken part in the NSS from the start of the survey. It is important to use a core population when considering time-series data, to ensure a fair comparison between years.

<sup>3</sup> The only characteristics that are not statistically significant are an ethnicity recorded as ‘Other Black’, entry qualifications that are already HE level and Performing arts at JACS subject level 2.

93. Respondents choosing the 'Not applicable' option for a question will count as having not responded to that question throughout these analyses.

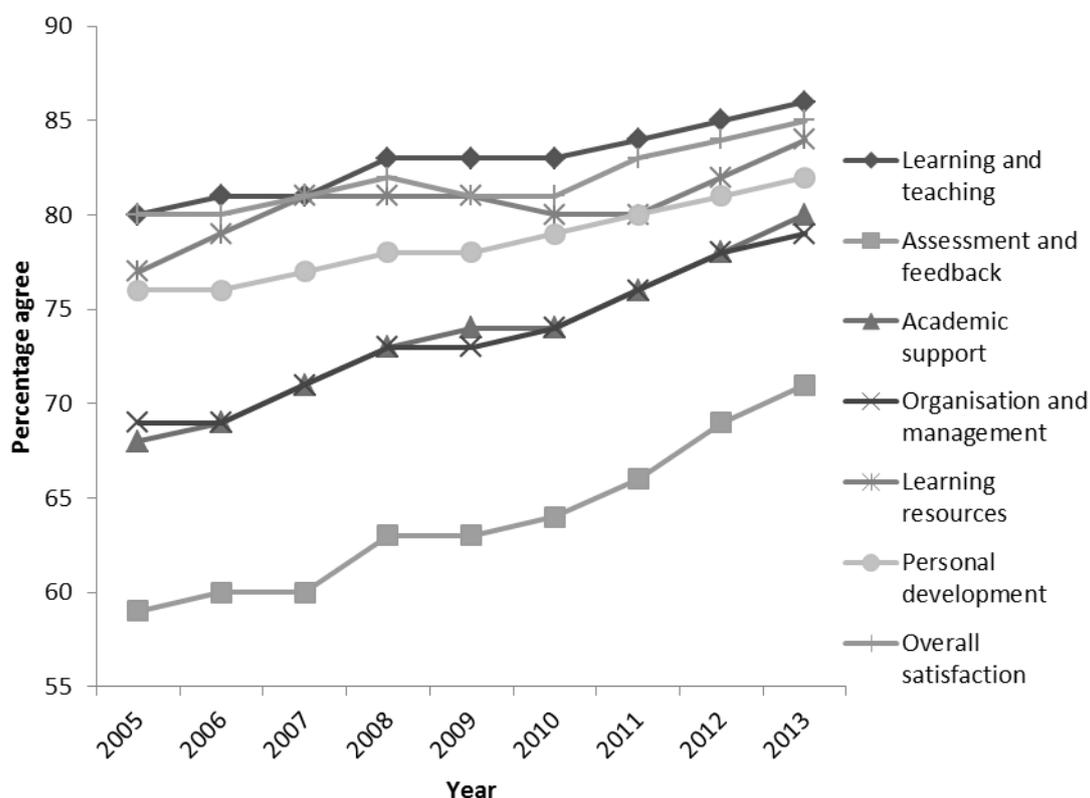
94. Figure 12 shows that the percentage of students who agree within each NSS question scale has increased over time. This percentage is the proportion of students who respond either 'definitely agree' or 'mostly agree' to the questions within the NSS question scale.

95. The largest increases in satisfaction between 2005 and 2013 were 12 percentage points in the 'assessment and feedback' and 'academic support' scales, increasing from 59 to 71 per cent and 68 to 80 per cent respectively.

96. The smallest increase in satisfaction was by five percentage points in the 'overall satisfaction' scale, where the results increased from 80 to 85 per cent.

97. Between 2008 and 2009, it appeared as though the results to nearly all of the question scales had become flat. However from 2009 onwards the upward trend observed in the early years of the NSS resumed.

**Figure 12: Satisfaction scores for each NSS question scale over the last nine years of the NSS**



### Satisfaction of the full-time core population split by characteristics

98. In this section, the relationship between student, course characteristics, and overall student satisfaction is examined. The results are first presented as raw univariate summaries, which do not take into account other factors that might affect the results, and then as findings from a multi-level model. The advantage of using a model, as opposed

to simple univariate analysis, is that it gives an understanding of whether the results are more closely related to one characteristic or another. For example, if there are high numbers of females studying Psychology, and on a univariate basis female and Psychology students both have high satisfaction rates. The model will determine whether it is subject, gender or both that is most closely related to the increased satisfaction.

### **Overall averages**

99. The averages referred to in this section (as specified in Table 3) are produced by calculating the 'overall satisfaction' score in a given year for the full-time core population of respondents.

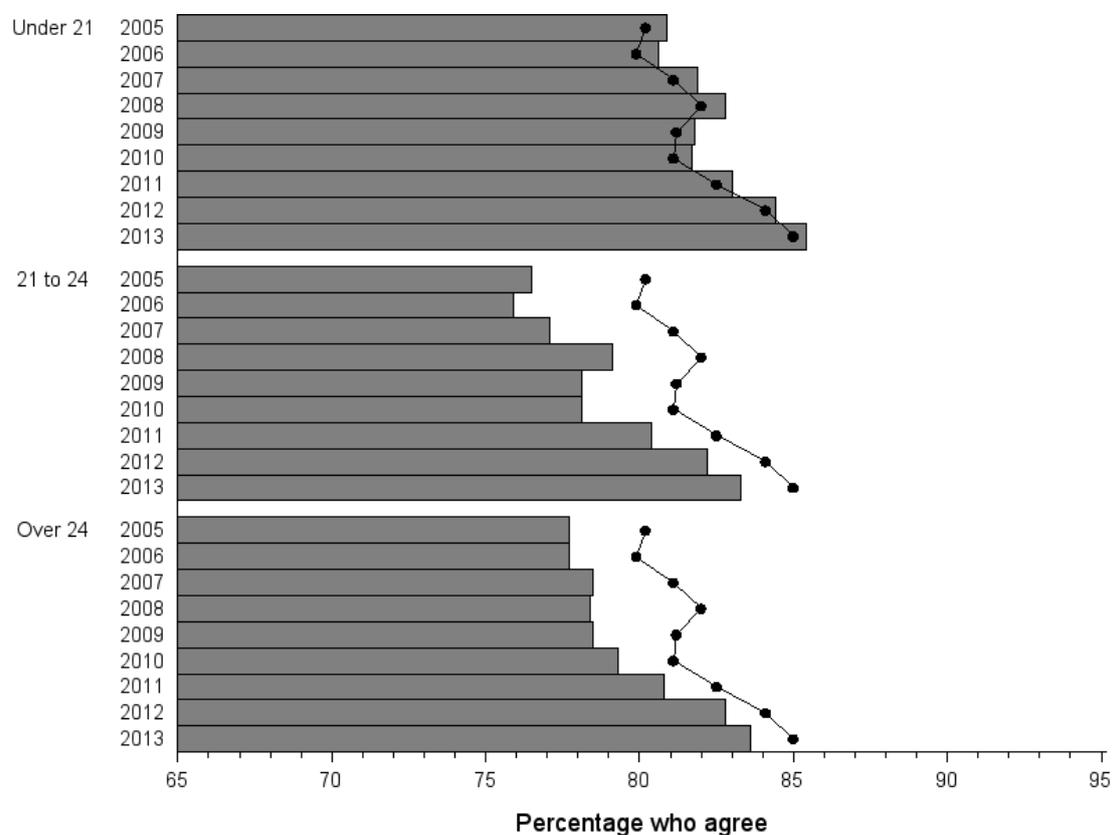
**Table 3: Percentage of the full-time core population who agree with the 'overall satisfaction' question**

<b>Year</b>	<b>Percentage who agree</b>
2005	80.2
2006	79.9
2007	81.1
2008	82.0
2009	81.2
2010	81.1
2011	82.5
2012	84.1
2013	85.0

100. The raw univariate summaries will be compared with the averages shown in Table 3. The modelling results will always be in relation to the satisfaction of the base group for the characteristic being considered, as listed in Table 2. Throughout this section graphics of the modelling results have only been provided if the results from modelling are different to the results from the univariate analysis.

## Age

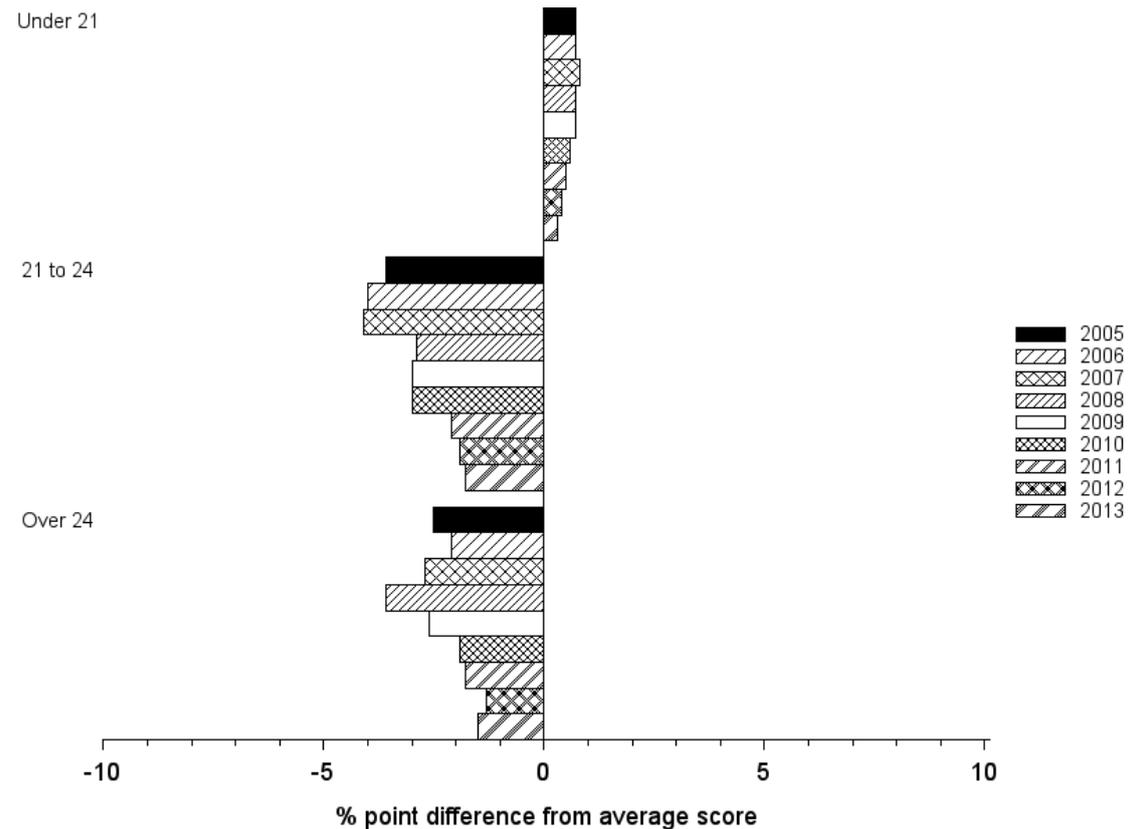
**Figure 13: 'Overall satisfaction' percentage who agree split by age group with a trend line for all students**



101. Figure 13 shows that those aged 21 and over had a lower percentage who agree than the sector for 'overall satisfaction' throughout all nine years of the NSS: the bars for the 21 to 24 and over 24 age groups are below the trend line for all years. The trend line shows the percentage who agree with 'overall satisfaction' for all students in the population. In more recent years, despite remaining below the average, both the 21 to 24 and over 24 age groups had a percentage who agree closer to that of the sector. For more information about how to interpret this type of graphic, see [Annex A paragraphs 7 to 10](#).

102. An alternative interpretation would be to consider the difference between the percentages who agree for each characteristic, and the average. The differences for each age group have been plotted in Figure 14. Essentially, Figure 14 is plotting the gap between the end of the bar and the dot in Figure 13. When presenting the results for different characteristics the most appropriate type of graph to clearly represent the results will be used. For more information about how to interpret this type of graphic see [Annex A paragraphs 2 to 6](#).

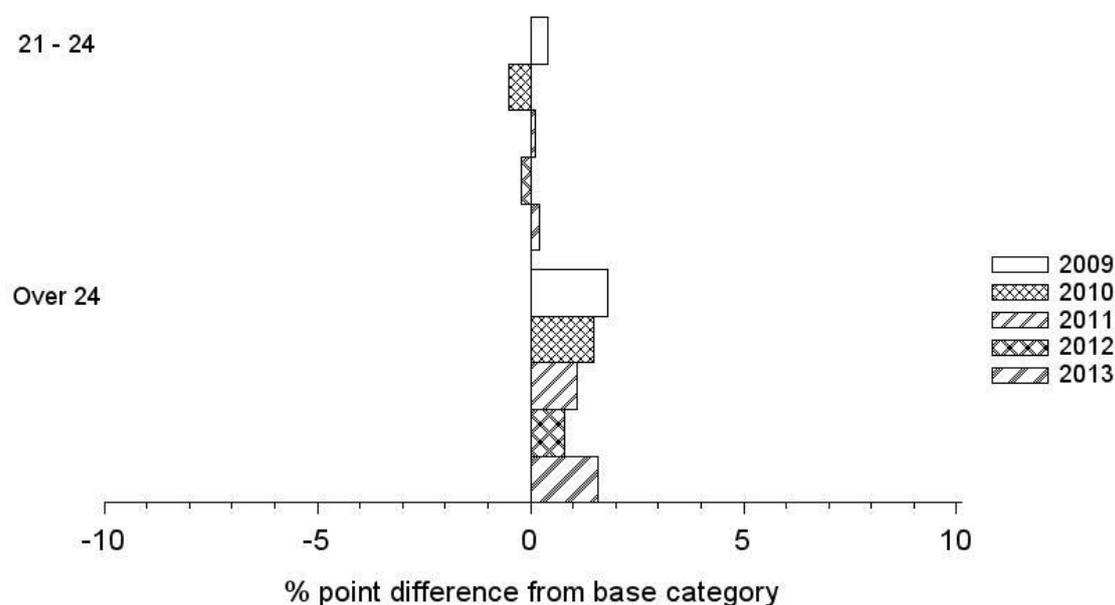
**Figure 14: Time series of difference in 'overall satisfaction' from average score by age group**



103. Figure 15 shows the modelled results split by age group where the base group is the under 21 category<sup>4</sup>. Unlike figure 14 it indicates that the 'overall satisfaction' of the 21 to 24 age group has fluctuated just above and below the results for under 21 year-olds across the last five years of modelled results. Over 24 year-olds were more satisfied than those under 21 during all years of the modelled results.

<sup>4</sup> Since the base variable is a comparator for the other categories, it is represented by the 0 line in the graphic and the category does not appear separately. For further information, see [Annex A paragraphs 14 and 15](#).

**Figure 15: Modelled difference in 'overall satisfaction' split by age group compared with those under 21**

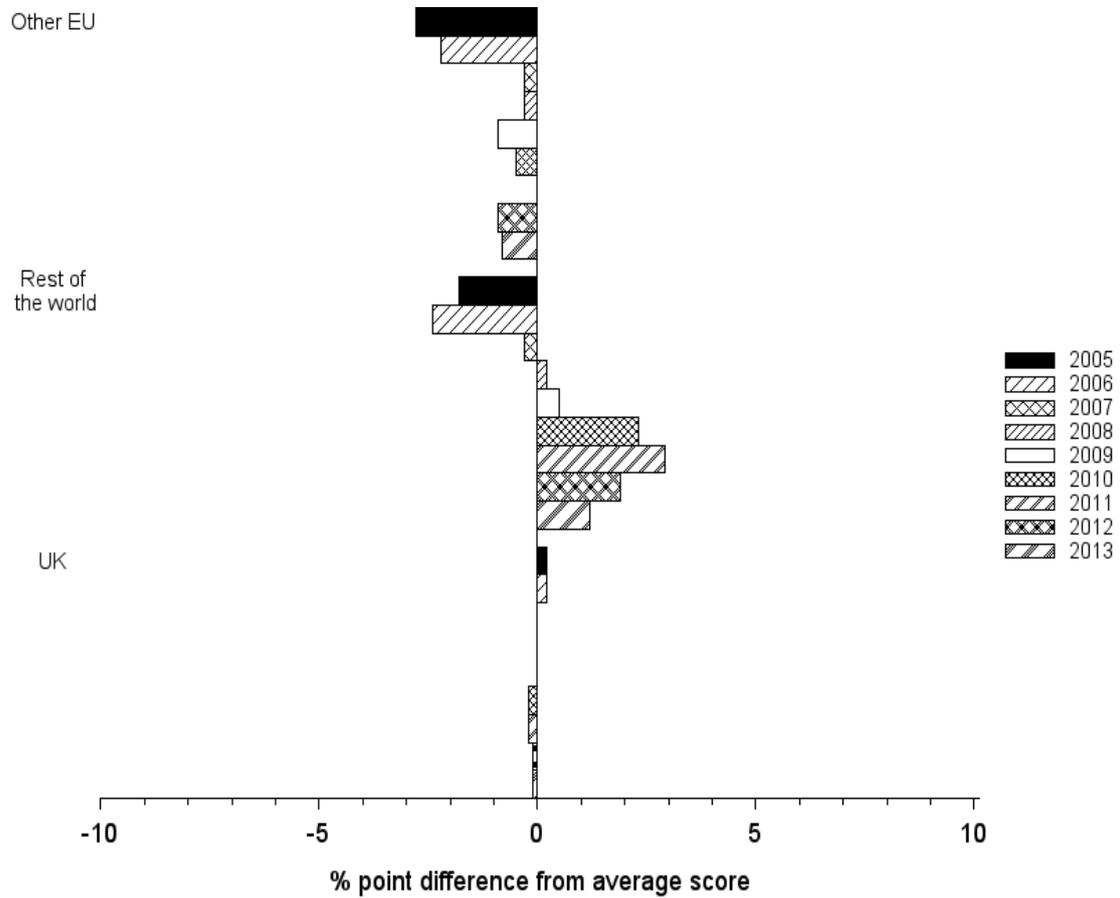


104. The results from the model are very different from the univariate results, so it is likely that the trend seen in Figures 13 and 14 is more closely related to other factors. This difference between the univariate statistics and the modelled results highlights the fact that, while univariate results can provide a good indication of the satisfaction of different groups of students, they do not account for other factors that may provide a better explanation of the results, and can therefore sometimes be misleading.

**Domicile**

105. In Figure 16, it is clear that in 2005 students not domiciled in the UK had a lower than average percentage who agree with 'overall satisfaction'. Over time, the difference decreased for other European Union (EU) students (excluding the UK), reaching a minimum difference of zero in 2011 before the percentage who agree declined below the average once more. For students domiciled in the rest of the world, the difference changed from negative to positive in 2008, meaning that the percentage who agreed with the statement on 'overall satisfaction' became higher than average.

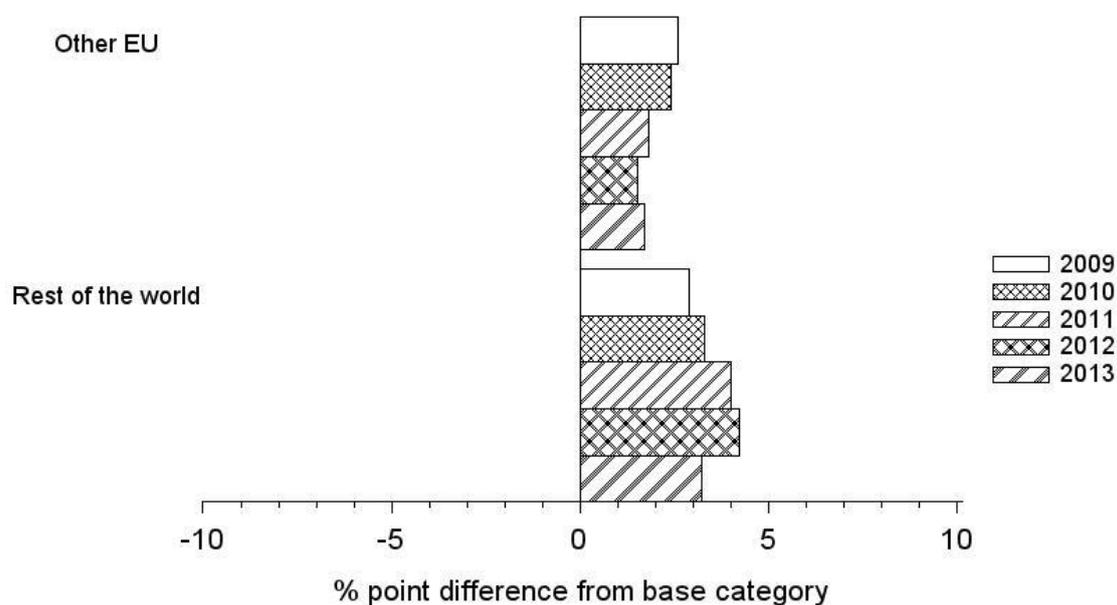
**Figure 16: Time series of difference in ‘overall satisfaction’ from average score by domicile**



106. According to the modelled results, shown in Figure 17, students domiciled in both other EU countries and the rest of the world are more satisfied than UK-domiciled students in the 2013 NSS results: the ‘overall satisfaction’ scores are 1.7 and 3.2 percentage points higher respectively.

107. Other EU students were 2.6 percentage points more satisfied than UK-domiciled students in the 2009 NSS modelled results, and this value has decreased gradually over time.

**Figure 17: Modelled difference in ‘overall satisfaction’ split by domicile compared with those domiciled in the UK**

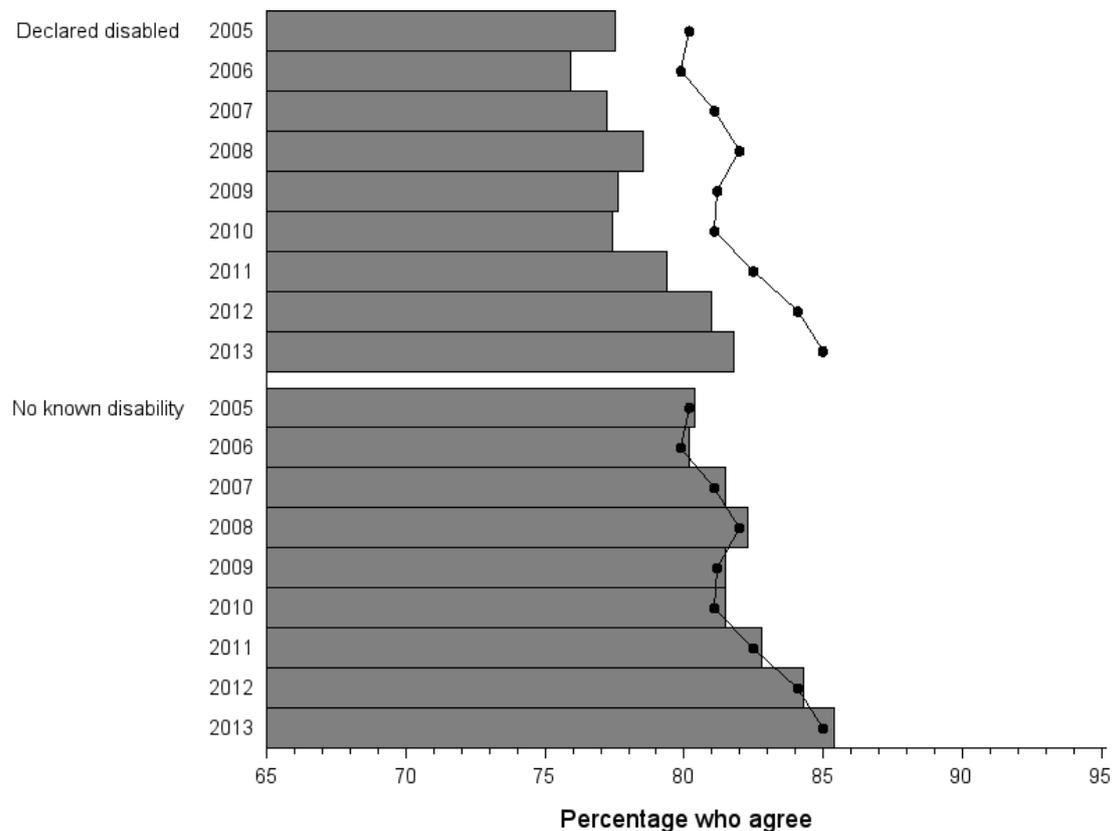


**Disability status**

108. It can be seen from Figure 18 that students with a declared disability had a consistently lower than average percentage who agree with ‘overall satisfaction’. It follows that those with no known disability were slightly more satisfied than average throughout the NSS<sup>5</sup>.

<sup>5</sup> The unknown disability and ethnic group categories have been removed from the results split by Disability Status and Ethnicity respectively, due to fluctuations in the populations and to prevent ambiguity as to whether information was refused, not sought or genuinely unknown.

**Figure 18: ‘Overall satisfaction’ percentage who agree split by disability status with a trend line for all students**



109. The modelled results follow the same pattern, as shown in Figure 18. In 2013 those who have declared a disability are 2.5 percentage points less satisfied than those with no known disability.

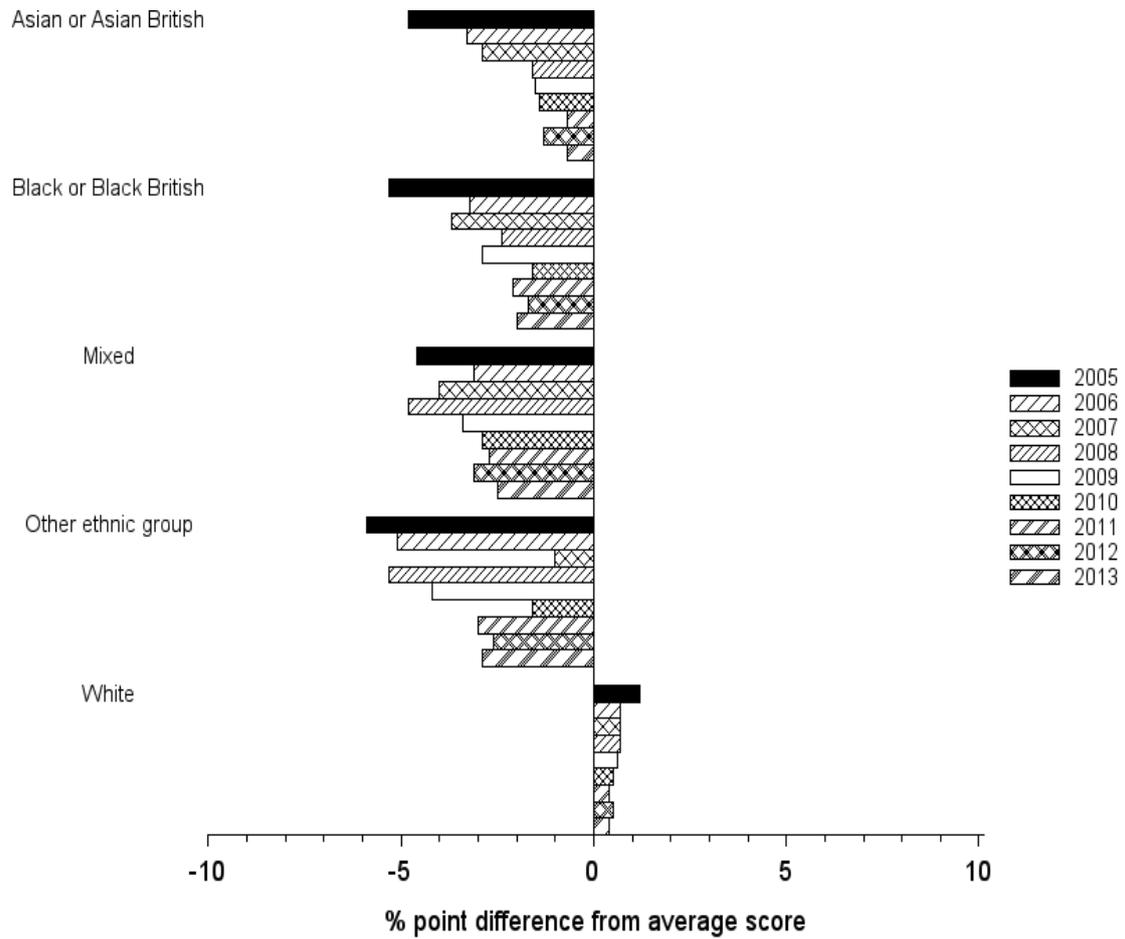
110. When the disability category is broken down into different types of impairment, the results are broadly similar to those seen in Figure 18. However, due to the small numbers within each impairment category, there is some fluctuation in the results between different impairment categories year on year. Since the individual impairment categories show broadly the same results as those in Figure 18, all published results for disability in this report will use the categories ‘declared disabled’ and ‘no known disability’.

### **Ethnicity<sup>6</sup>**

111. With the exception of White students, the ‘overall satisfaction’ result for each ethnic group has always been below the average. However, the results have moved closer to the average over the nine years of the survey.

<sup>6</sup> These results are for the full-time core population of UK-domiciled students.

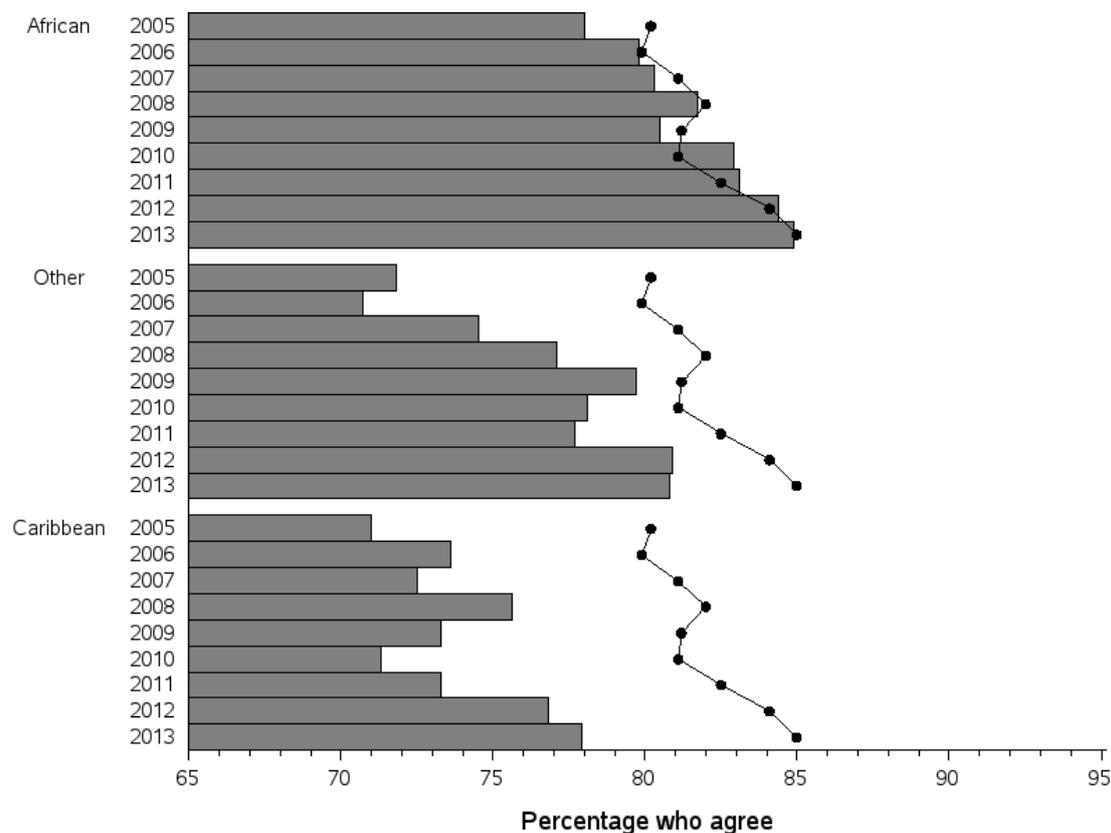
**Figure 19: Time series of difference in 'overall satisfaction' from average score by ethnicity**



112. Some of the ethnic groups shown above can be split into finer categories, allowing exploration of the results at a more detailed level. Figure 20 demonstrates how different the responses within a broad ethnic group can be.

113. When considering the Black ethnic groups it can be seen that the 'overall satisfaction' of Black African students moved above the average in 2010 before dropping back to just below the average in 2013. Black Caribbean students have been less satisfied than the average throughout the lifetime of the NSS. The 'overall satisfaction' for Other Black ethnic groups has always been below the average, but subject to fluctuations.

**Figure 20: Overall satisfaction percentage who agree split by Black ethnic groups with an average trend line**



114. The modelled results for the 2013 NSS also show a difference in satisfaction between Black African and Black Caribbean students, who are 1.8 percentage points more satisfied and 4.1 percentage points less satisfied respectively, when compared to White students. These results are consistent across the five years of modelled NSS data.

115. The 2009 modelled results show that Chinese students were slightly less satisfied (by 0.1 percentage points) than White students. However, in 2011 Chinese students were 2.1 percentage points more satisfied than White students, and levels of satisfaction for Chinese students have been increasing for the last three years of the survey. This effect is the largest positive difference of all the ethnic groups.

### Subject

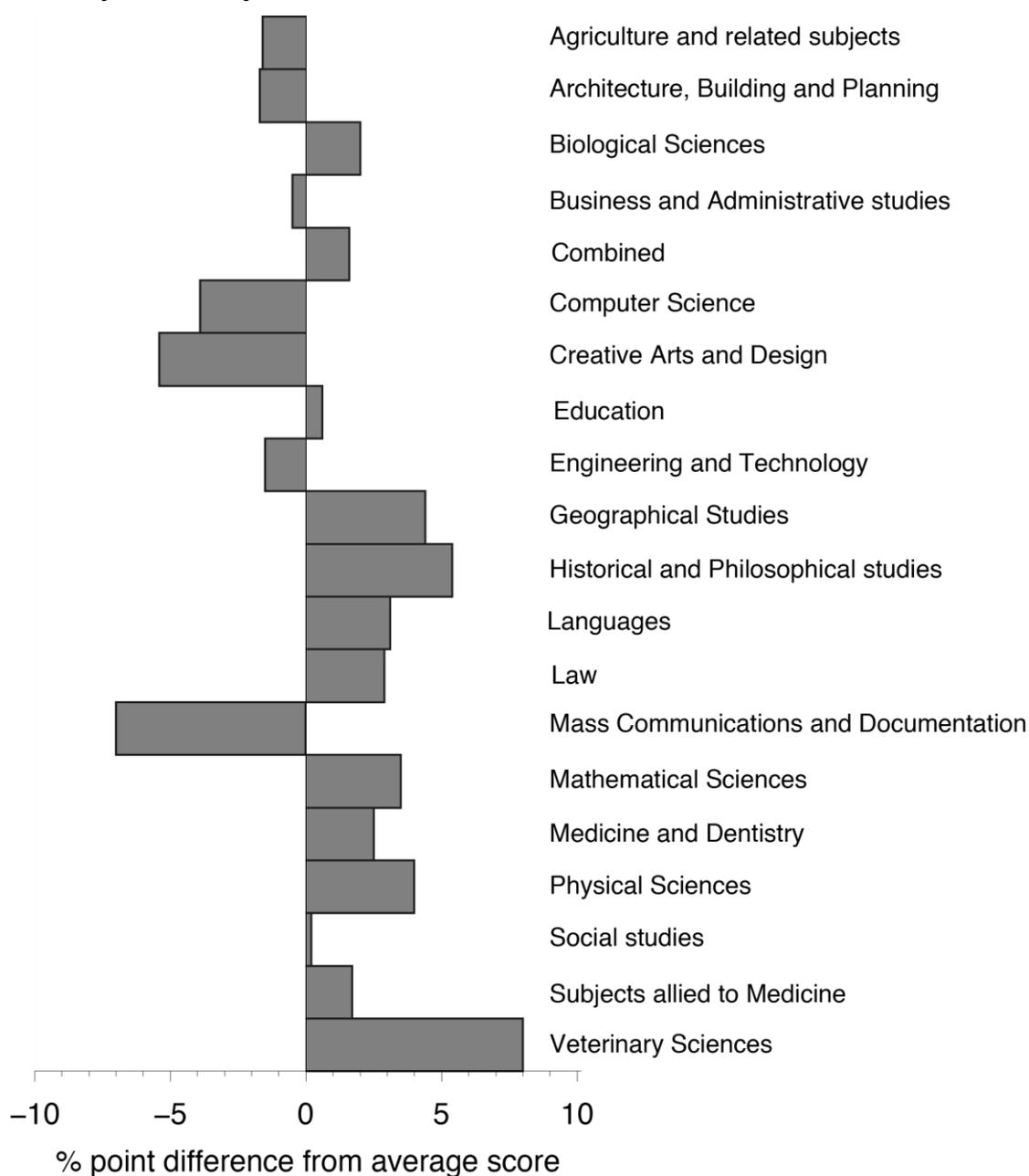
116. When considering the modelled results, by far the biggest variations relate to subject of study. For example, if you consider JACS level 2 subjects those studying Veterinary science have an 'overall satisfaction' 11.1 percentage points higher, and those studying Other creative arts 4.0 percentage points lower, than those studying Computer science.

117. It is possible to view the univariate analysis split by all 41 subjects at JACS level 2 for all nine years of NSS data by using the NSS online data tool which can be found at [www.hefce.ac.uk/whatwedo/lt/publicinfo/nss/nsstrend/](http://www.hefce.ac.uk/whatwedo/lt/publicinfo/nss/nsstrend/). The five years of modelled results can be found in Annex I.

118. The univariate results for subjects at JACS level 1 can be seen in Figure 21, which clearly demonstrates a difference in satisfaction between different subject groups. When considering the univariate results, Mass communications and documentation students are the least satisfied and Veterinary sciences students are the most satisfied.

119. Note that the univariate results considered in paragraph 118 and shown in Figure 21 relate to JACS subject level 1, whereas the modelling results in paragraph 116 refer to subjects at JACS subject level 2. There may be some differences in the results between those paragraphs and figures since some names and subjects that feed into the results are the same between JACS subject level 1 and JACS subject level 2, but others change.

**Figure 21: Difference in 'overall satisfaction' from average 'overall satisfaction' score by JACS subject level 1**



120. The NSS results for the last five years of data have been modelled together, to calculate the effect that each year has on the NSS results. The 2011 results are the base group in this calculation. Table 4 presents the results.

**Table 4: Modelling ‘overall satisfaction’ results to determine a year effect for the last five years of the NSS**

<b>Year</b>	<b>Difference in percentage who agree</b>
2009	-1.5%
2010	-1.3%
2011	0.0%
2012	1.7%
2013	2.3%

121. Table 4 shows that, for the years being considered, the NSS results for ‘overall satisfaction’ were at their lowest in 2009, 1.5 percentage points below the average. Over the next four years the ‘overall satisfaction’ increased. In 2013 the NSS results were at their highest, 2.3 percentage points above the average. These results are consistent with Figure 12, which also shows that the percentage of respondents who agree with the ‘overall satisfaction’ question has increased steadily over time.

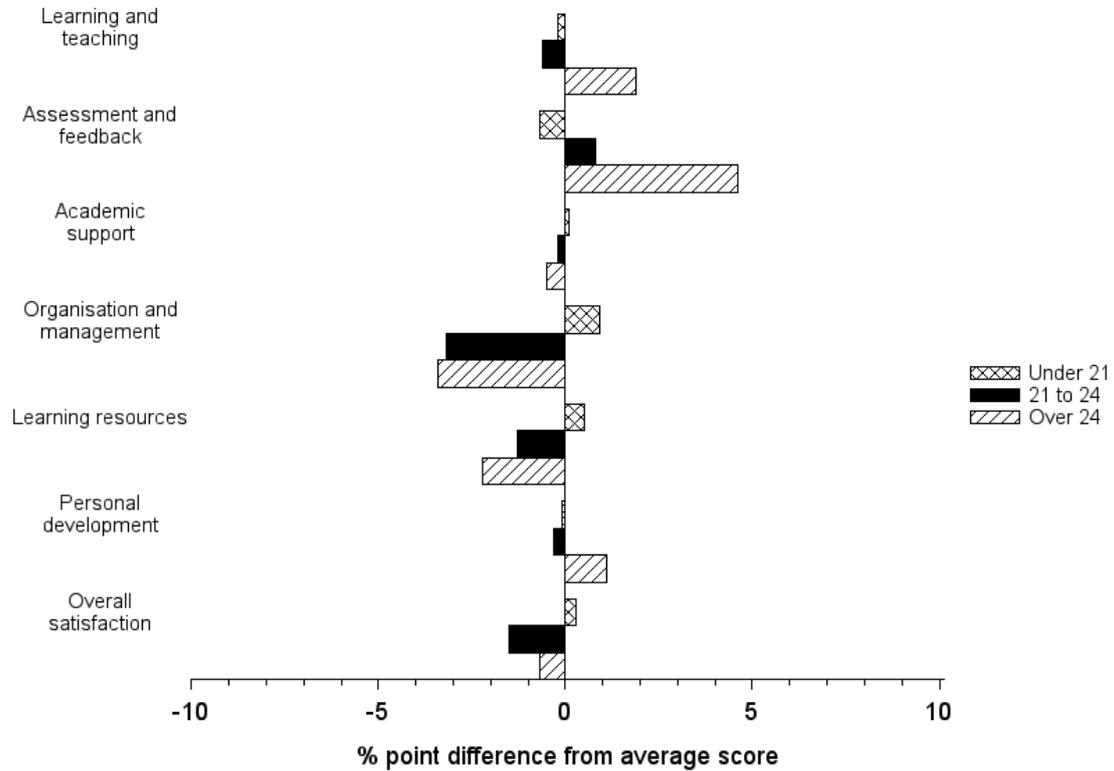
### **Satisfaction of full-time 2013 population by characteristics**

122. Time-series analysis requires a core population who have always been part of the NSS, so to provide an analysis of the wider NSS population this section considers only the 2013 NSS results. This means that all students registered at UK HEIs and English further education colleges are included in the following results. Since there is a difference in population, the ‘overall satisfaction’ scores presented here could differ from those discussed in the previous section.

123. The data are first presented as raw univariate results for all the NSS question scales, split by different characteristics. This is followed by an analysis of the modelling results for each question in the NSS, again considering different characteristics.

## Age

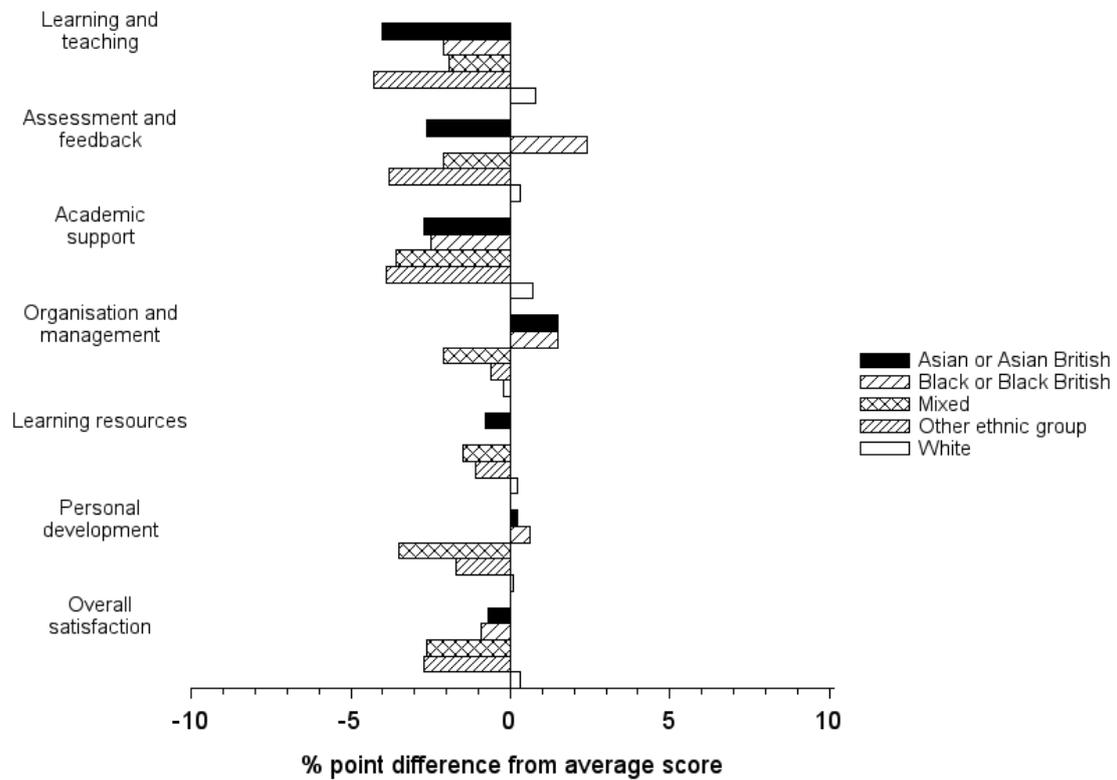
**Figure 22: Difference in the average percentage who agree score and the percentage who agree split by age group for the 2013 NSS**



124. Figure 22 shows that the over-24 and 21 to 24 age groups had a lower percentage who agree than average within the 'organisation and management', 'learning resources' and 'overall satisfaction' scales. The 'teaching and learning', 'assessment and feedback' and 'personal development' questions saw a higher percentage who agree than the average when considering the over-24 age group.

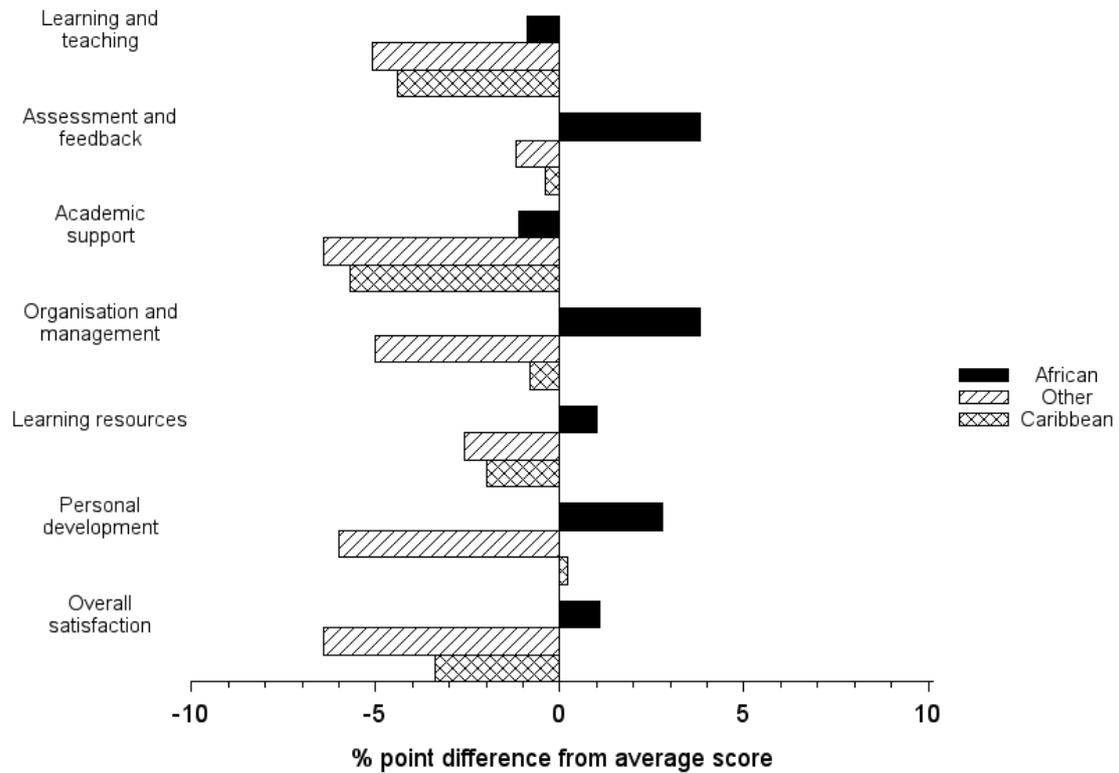
## Ethnicity

**Figure 23: Difference in the average percentage who agree and the percentage who agree split by ethnicity for the 2013 NSS**



125. Figure 23 illustrates that the Mixed and Other ethnic groups have lower than average percentage who agree throughout the survey. The results for the Asian and Black ethnic groups vary between different scales.

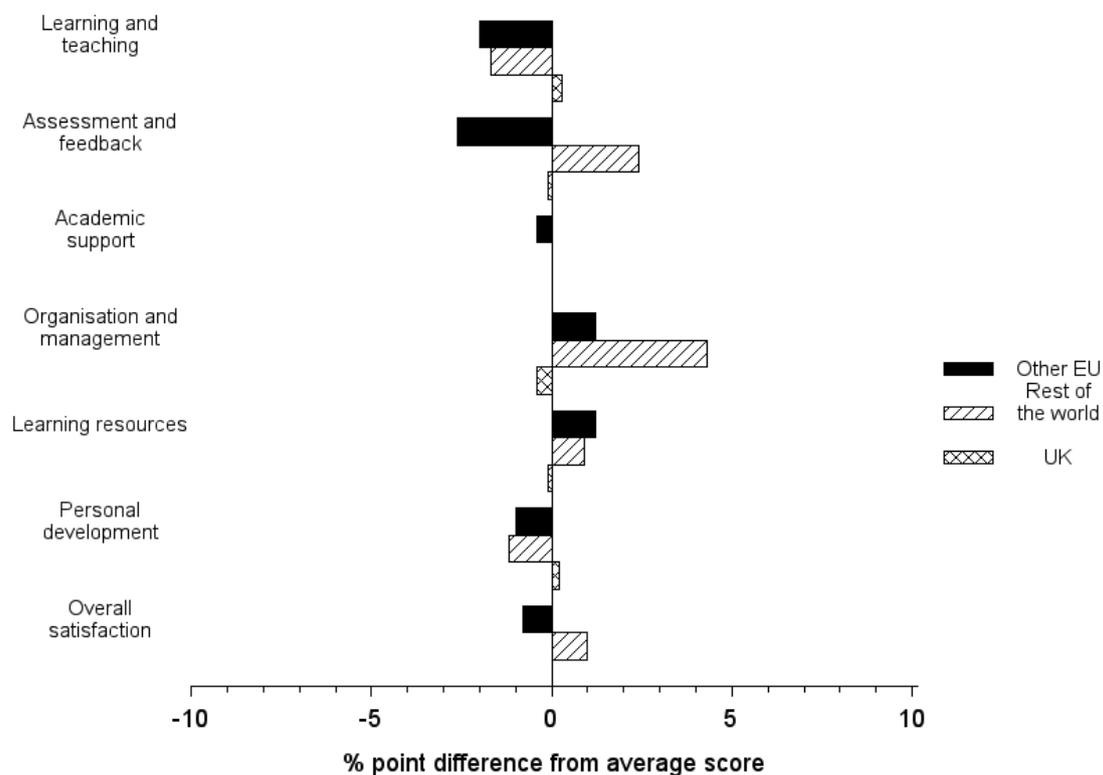
**Figure 24: Difference between the percentage who agree for the sector and individual Black ethnic groups for the 2013 NSS**



126. Figure 24 highlights the variation in satisfaction between the ethnicity categories within the Black and Black British ethnic group. It is clear that Black Caribbean students had a lower than average percentage who agree for all the categories. The results are similar for Other Black ethnic groups, except in 'personal development'. Black African students had a higher percentage who agree than the average for all the scales apart from 'learning and teaching' and 'academic support'.

## Domicile

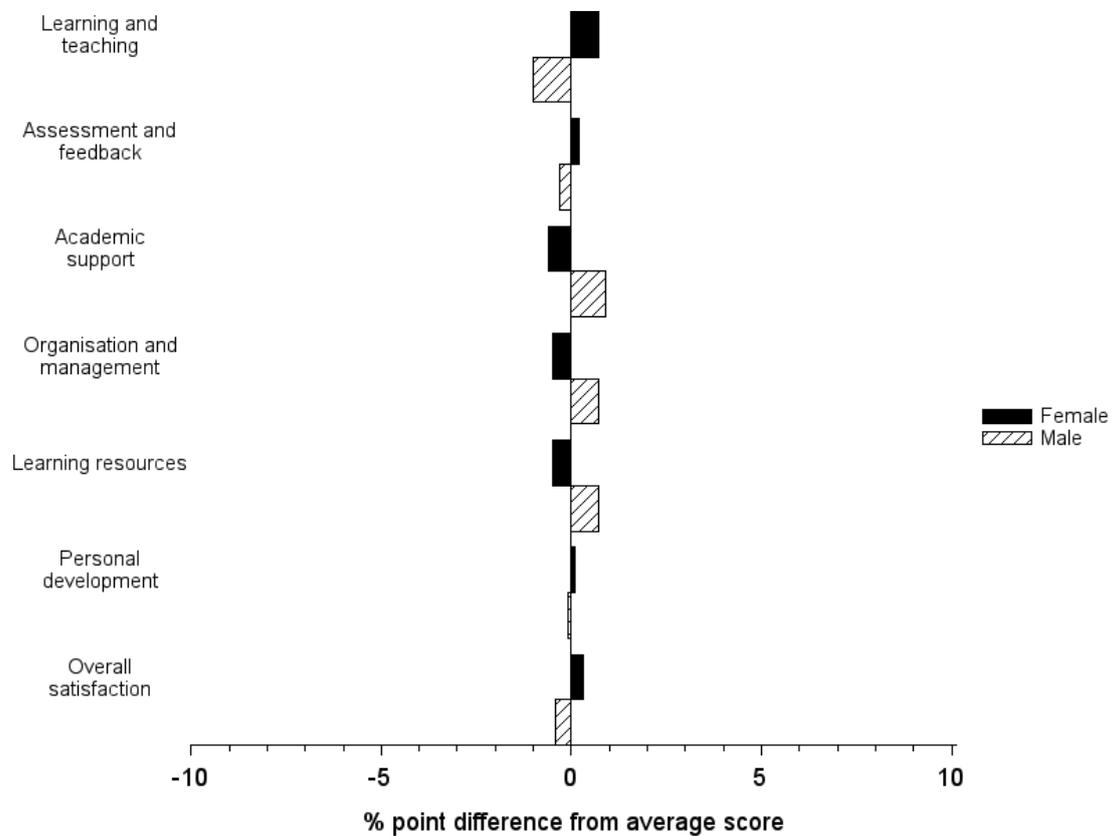
**Figure 25: Difference between the average percentage who agree and the percentage who agree split by domicile for the 2013 NSS**



127. Figure 25 shows that there is variation in the difference between the average percentage who agree score and those obtained from students domiciled in the EU (excluding the UK) and the rest of the world, for each of the NSS question scales.

## Gender

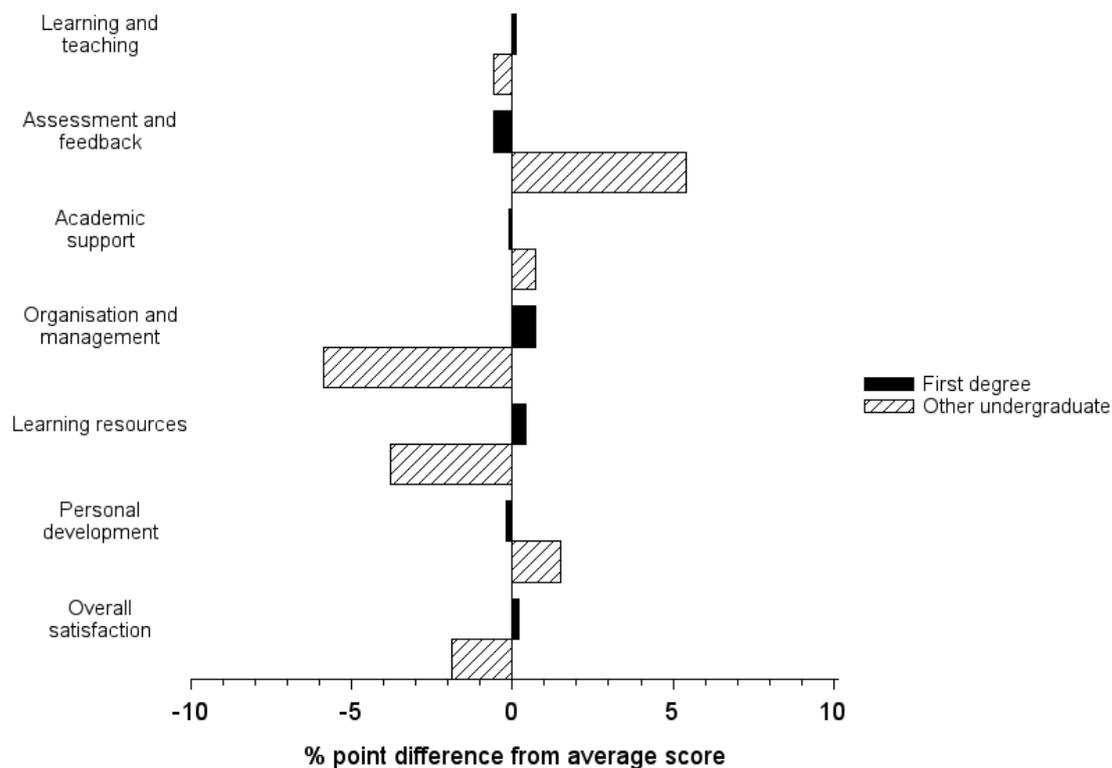
**Figure 26: Difference between the average percentage who agree and the percentage who agree split by gender for the 2013 NSS**



128. It can be seen from Figure 26 that the gender with the highest percentage who agree fluctuates from one NSS scale to the next. The differences are fairly small, and the modelled results for the 2013 NSS show that males are only 0.2 percentage points less satisfied with regards to 'overall satisfaction' when compared to females, which is not a material difference.

## Level of study

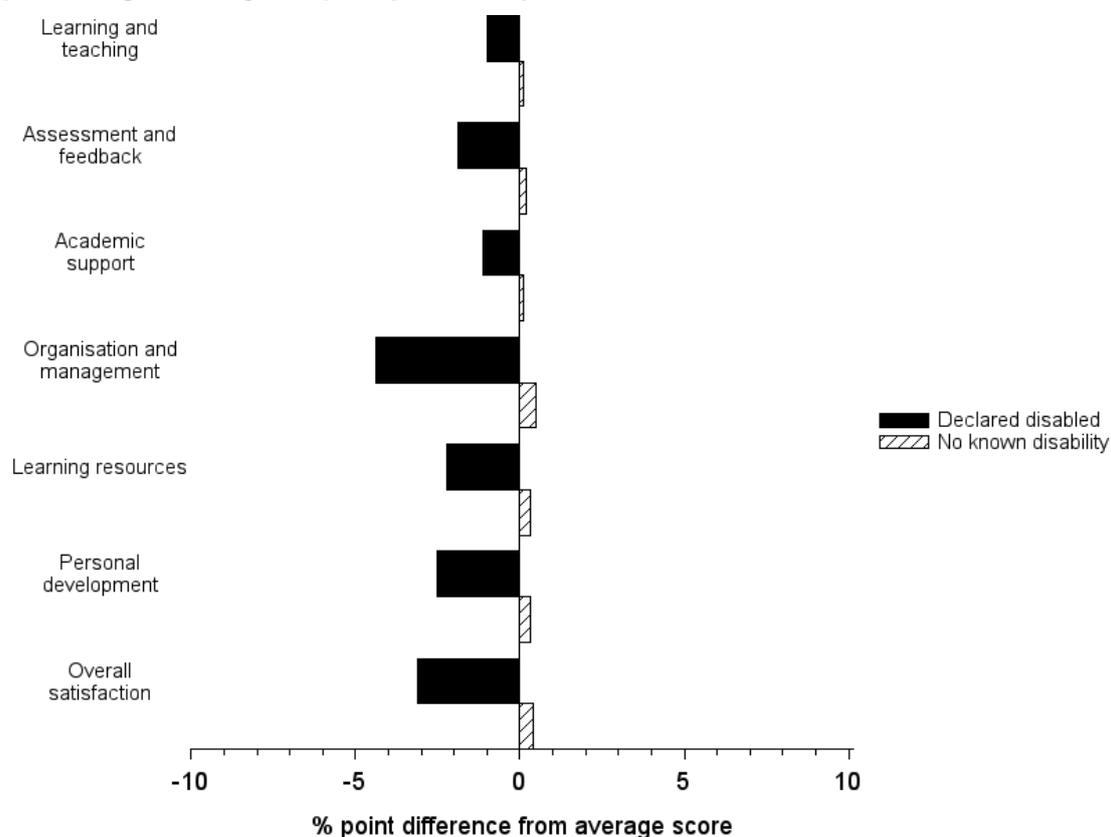
**Figure 27: Difference between the average percentage who agree and the percentage who agree split by level of study for the 2013 NSS**



129. Figure 27 demonstrates that, for those working towards other undergraduate qualifications, the percentage who agreed with the 'assessment and feedback' questions was much higher than the average. The opposite was true for the 'organisation and management' and 'learning resources' NSS question scales, where the percentage who agreed was lower than average.

## Disability status

**Figure 28: Difference between the average percentage who agree score and the percentage who agree split by disability status for the 2013 NSS**



130. Figure 28 shows that those who have a declared disability have a lower than average percentage who agree with the questions in each scale.

### Modelling results for the full-time 2013 population

131. As described in paragraphs 80 to 81, any characteristic effects on the NSS data are being sought through a logistic regression model. Since logistic regression does not use an averaging methodology, each question has been modelled separately. The modelling results for all questions can be found in Annex H.

132. It is not possible to determine the causes of the differences reported here; the modelling can only determine which student and course characteristics are most closely related to particular responses. Understanding the underlying reasons why certain groups are more or less satisfied would require qualitative work with those students, and where differences are relatively small it might not be possible to determine root causes.

### Method of response

133. There is a clear difference in satisfaction when the method of response is considered. Those who respond by post are less satisfied for every question, whereas the satisfaction of phone respondents fluctuates between more and less satisfied across all questions.

### **Declared disability**

134. Students who are declared disabled are materially less satisfied with every question, with the exception of 'I have been able to access general IT resources when I needed to'. On this topic they are 0.6 percentage points happier than those with no known disability.

### **Ethnicity**

135. Across the 'teaching and learning', 'assessment' and 'academic support' questions, the majority of ethnic groups are less satisfied than white students. Conversely, they are more satisfied with questions regarding 'feedback' and 'organisation and management'.

136. Responses under 'learning resources' do not vary significantly by ethnicity. The same can be said for the three questions in the 'personal development' scale, except for the results for Black Caribbean and Black African students. Black African students are 3.3, 4.0 and 2.4 percentage points more satisfied across the three questions in this scale which are 'The course has helped me to present myself with confidence', 'My communication skills have improved' and 'As a result of the course, I feel confident in tackling unfamiliar problems'. By contrast, Black Caribbean students, are 5.9, 4.1 and 6.1 percentage points less satisfied.

### **Domicile**

137. Students domiciled in a country outside the EU are more satisfied for all questions than UK domiciled students. This difference in satisfaction is particularly large when considering the three feedback questions from the 'assessment and feedback' scale. Those domiciled in EU countries other than the UK are also more satisfied for the majority of the questions, excepting 'Staff are enthusiastic about what they are teaching' and 'The course is intellectually stimulating'.

### **Age**

138. The results for 21 to 24 year-olds fluctuated between slightly more and slightly less satisfied when compared with the under 21-age group. Over 24s are much more satisfied with the 'teaching and learning' and 'assessment and feedback' questions; they are more than two percentage points more satisfied in every question within the 'assessment and feedback' scale. The satisfaction of this group of students is variable for the remainder of the questions.

### **Level of study**

139. Students studying towards an Other undergraduate qualification are more satisfied in the majority of the questions than those studying for a First degree. This is particularly noteworthy in the 'assessment and feedback' scale, where Other undergraduate students are 5.0 percentage points more satisfied that 'Feedback on my work has helped me to clarify things I did not understand'.

### **Previous school type**

140. Students who previously studied at an Independent school are less satisfied with most questions on the NSS. In fact, there are only three questions in the survey where

they are more satisfied than students who previously attended a State school. Those three questions are 'The timetable works efficiently as far as my activities are concerned', 'The library resources and services are good enough for my needs' and 'I have been able to access general IT resources when I needed to'.

### **Days taken to respond to the survey**

141. Those who respond to the NSS within 14 to 28 days are more satisfied with every question than those who answer within the first 14 days. Those who take 28 to 42 days are mostly less satisfied, but fluctuate to more satisfied in a few question scales, mostly concentrated around 'organisation and management' and 'personal development'. Those who take more than 42 days to respond are less satisfied in the majority of cases: this is most apparent regarding the 'teaching and learning', 'assessment and feedback' and 'academic support' questions.

### **Students who are franchised out**

142. Students who are taught at a different institution from where they are registered ('franchised out') are generally more satisfied. However, this is not the case for the majority of questions regarding 'organisation and management' and 'learning resources'. The most striking difference in satisfaction is whether students believe 'The library resources and services are good enough for my needs': here, franchised-out students are 10.2 percentage points less satisfied than those who are taught and registered at the same institution.

### **Qualifications on entry, gender and POLAR3**

143. The differences in satisfaction are minimal when the results are split by broad qualifications on entry, gender or POLAR3 quintile.

### **Subject (JACS level 2)**

144. Again splitting the results by subject provides the biggest variations in satisfaction. There are too many subjects to consider them all here, but the main themes are highlighted in the remainder of this section. The modelled results for all the questions, split by subject and the other characteristics discussed here, can be found in Annex J.

145. Those studying Veterinary sciences score among the highest, if not the highest, in the 'teaching and learning', 'academic support', 'learning resources' and 'personal development' scales. Medicine and dentistry and Nursing students also score highly in the 'learning resources' and 'personal development' scales.

146. History and archaeology students have an increased level of satisfaction when compared with Computer scientists across the 'assessment and feedback' questions. However, there is a lot of variation between the most satisfied subject groups across the questions in this scale.

147. Human and social geography, Mathematical sciences and Finance and accounting students are all more satisfied with the 'organisation and management' of their courses.

148. There were no subjects whose students were much less satisfied with the 'teaching and learning' questions, with the exception of Communications and information studies,

whose students are 7.1 percentage points less satisfied that 'The course was intellectually stimulating'.

149. Within the 'assessment and feedback' scale, there is a split between the assessment questions and the feedback questions as to which subjects' students are least satisfied. Architecture, building and planning students are least satisfied with the assessment questions. For the feedback questions, Veterinary sciences and Medicine and dentistry students are among the least satisfied with all three questions.

150. Students on courses of combined subjects are least satisfied when considering whether 'I have received sufficient advice and support with my studies' and 'Good advice was available when I needed to make my study choices'. However, when considering the statements 'I have been able to contact staff when I needed to', students in Social work (at 6.6 percentage points below average) and Nursing (3.2 percentage points below average) were the least satisfied.

151. Nursing and Veterinary sciences students were among the least satisfied with the 'organisation and management' questions. Nursing students were 11.0 percentage points less satisfied that 'The course is well organised and running smoothly'.

152. There is a lot of variation in the least satisfied subjects across the 'learning resources' scale. It is important to bear in mind that respondents choosing the 'Not applicable' option will count as having not responded.

153. Mathematical sciences students are least satisfied when it comes to considering whether 'The course has helped me to present myself with confidence' (4.9 percentage points less satisfied than Computer science students) and 'My communication skills have improved' (8.7 percentage points less satisfied). 'As a result of the course, I feel confident in tackling unfamiliar problems' finds Other creative arts students the least satisfied, closely followed by those studying Technology.

### **Institutional effects**

154. As described in paragraph 82, since the NSS results vary by institution a multi-level logistic regression model has been used to analyse the data.

155. The model approach we have taken allows us to examine the unexplained variation in the satisfaction of students at each institution, after accounting for the factors included in the model (ethnicity, age, gender and so forth). Thus, the remaining unexplained difference between the satisfaction observed at an institution and the expected level based on the other variables included in the model can be estimated.

156. The institutional residuals from modelling 'overall satisfaction' for the 2013 full-time core population are given in Annex K. The unexplained variation in 'overall satisfaction' attributed to institutions by the model ranges from 17 percentage points less satisfied to just under nine percentage points more satisfied than the average. It should be noted that these figures represent the variation that is not explained by variables included in the model, it is possible that these differences are wholly, or in part, explained by some variable that has not been included in the model.

157. It is possible to determine whether or not the institutional effects were statistically significant. Table 5 shows how many institutions have had statistically significant effects,

and whether they were positive or negative, over the last five years of the NSS with regard to 'overall satisfaction'.

158. Table 5 shows that, for the 2013 survey, 49 institutions had an institutional effect for 'overall satisfaction' that was statistically significantly higher than would be expected. 35 institutions had an institutional effect that was not statistically significant, and 52 that had an effect that was statistically significantly lower than would be expected.

**Table 5: Significance of institutional effects from 2009 to 2013**

<b>Significance of institutional effect</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>
Significant and positive	53	58	54	48	49
Not significant	26	26	34	43	35
Significant and negative	58	55	49	45	51

159. The number of institutions that had a statistically significant positive effect dropped between 2009 and 2013 from 53 to 49 institutions. This is also the case for institutions with a statistically significant negative effect on the NSS results, changing from 58 to 51 over the same time period.

160. 25 institutions have had a statistically significant negative effect on the NSS results for all five years that are being considered. Conversely, 26 institutions have had a statistically significant positive effect for all five years.

## Annex A: Explanation of techniques

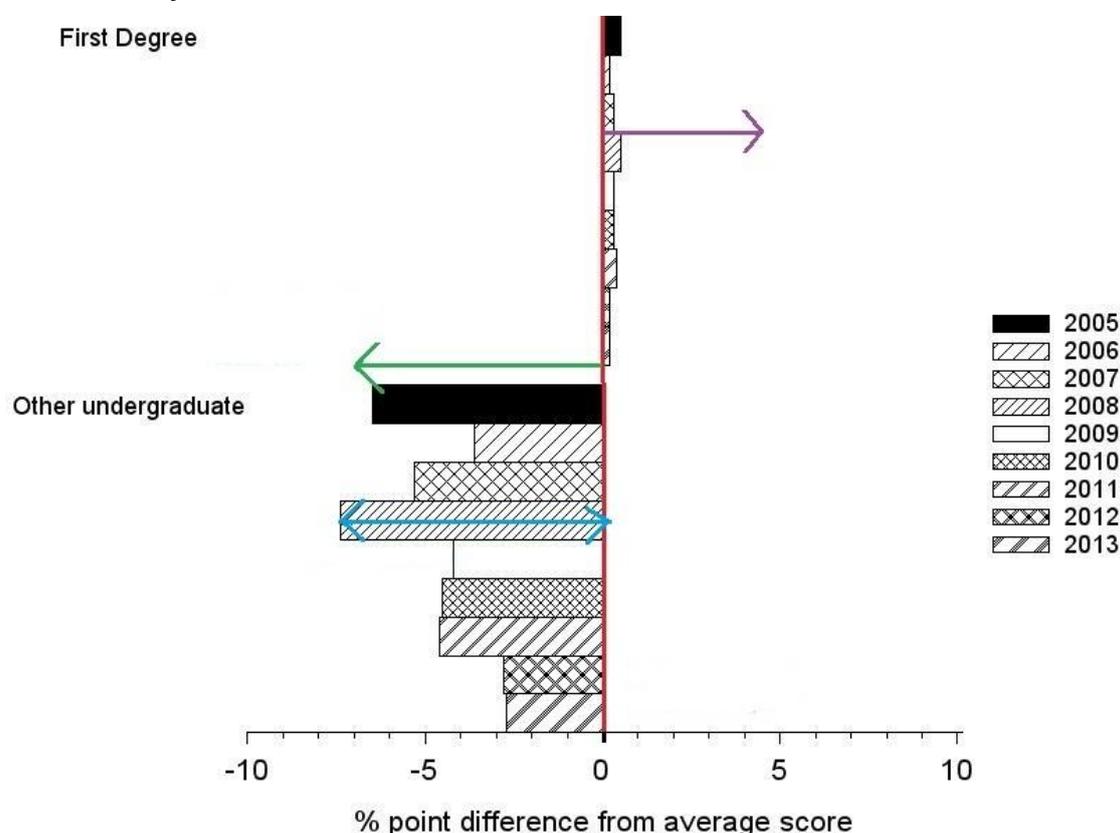
1. This section aims to explain the techniques that have been used to analyse the National Student Survey (NSS) results. It will describe the different statistical techniques that have been used to analyse the NSS data and explain how to interpret the results presented in this report.

### Graphics

#### Graphic type one

2. The raw un-modelled univariate results will be presented in one of two types of graphic. Both these types of figure first appear in this report under the heading 'Age'. Figure 29 illustrates the first type of graphic.

**Figure 29: Time series of difference in 'overall satisfaction' from average score by level of study**



3. Figure 29 shows the difference between the 'overall satisfaction' of those studying Other undergraduate and First degree qualifications and the average result for each year.

4. Each year there is a different percentage who agree with 'overall satisfaction for the sector': these figures are shown in Table 3. The zero line which runs vertically up the centre of the figure, drawn in red in Figure 29, shows the value that would represent no difference between students with the chosen characteristics (in this case First degree and Other undergraduate students) and the sector average in a given year.

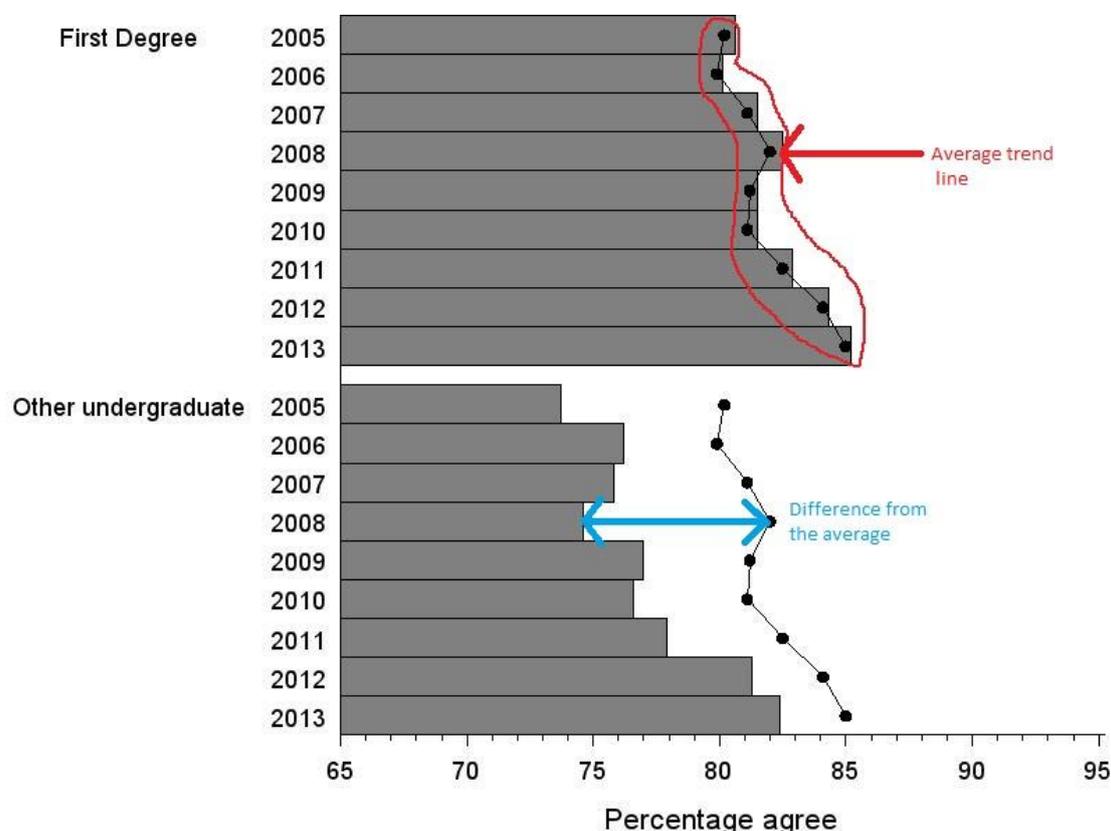
5. Values to the right of the zero line, such as that indicated by the uppermost, purple arrow in Figure 29, represent years when the satisfaction of students with that characteristic is above the average for the sector. In Figure 29, students studying towards First degree qualifications are more satisfied than students across the sector as a whole.

6. Conversely, values to the left of the zero line, such as that shown by the lower, green arrow in Figure 29, represent years when the satisfaction of students with that characteristic is below the average satisfaction of the sector. Again, in Figure 29, students studying towards Other undergraduate qualifications are much less satisfied than the sector average.

### Graphic type two

7. The second type of graphic used is illustrated in Figure 30.

**Figure 30: Overall satisfaction percentage who agree split by level of study with a trend line for all students**



8. Figure 30 shows the percentage who agree with the statement of 'overall satisfaction', split between First degree and Other undergraduate students for all years of study.

9. Figure 30 also contains an average trend line, circled in red. The trend line is the average for all students in the population, so will be identical in both the First degree and the Other undergraduate sections of the figure. The trend line helps to indicate how the results for each type of characteristic compare with the average.

10. It is clear from Figure 30 that the percentage of Other undergraduates who agree with the 'overall satisfaction' question has increased over time. However, comparison of Other undergraduate results with the trend line shows that these students' have always been less satisfied than average.

**How the two figures interact**

11. Figure 29 shows the difference between the percentage who agree, split by a characteristic variable, and the average. Figure 30 shows the percentage who agree, split by a characteristic variable, alongside a trend line to show how students are scoring relative to the average.

12. The distance between the end of a bar and the dot of the trend line in Figure 30, represented in the lower half of the figure by the blue arrow, is the same as the width of the equivalent average bar in Figure 29, again shown by the lowermost, blue arrow.

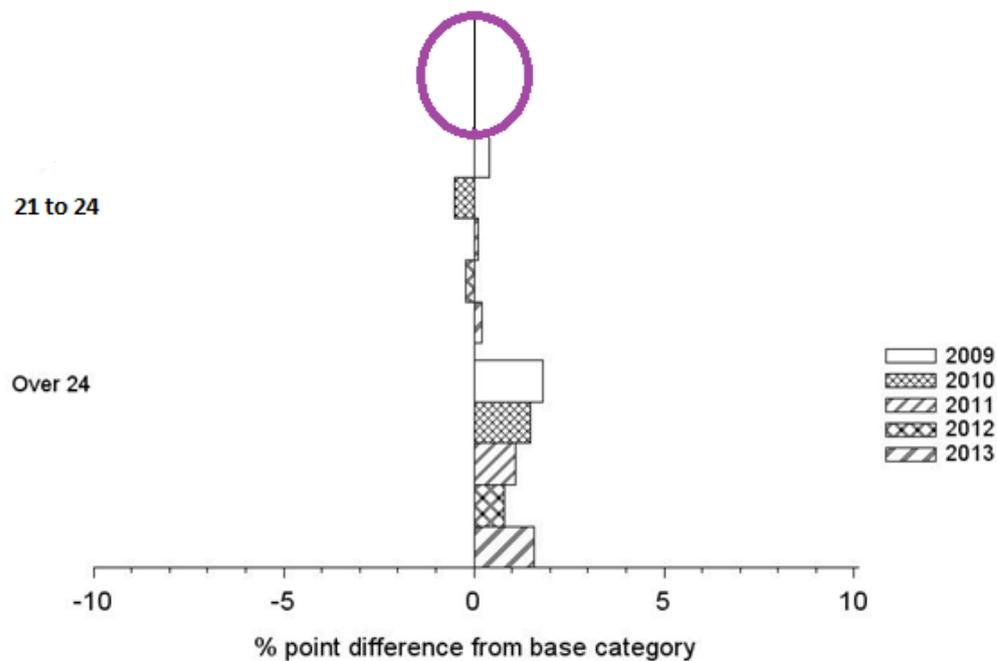
13. This report presents different characteristics using the most appropriate type of graph.

**Modelling graphics**

14. Figure 31 shows how the modelling results are presented with an additional line representing the base group. They can be interpreted in the same way as Figure 29.

15. The base group is not included on the graphics of the modelling results in the report because, as the comparator for the modelling results, it would appear as a line at zero. This line has been added to Figure 31 and circled in purple.

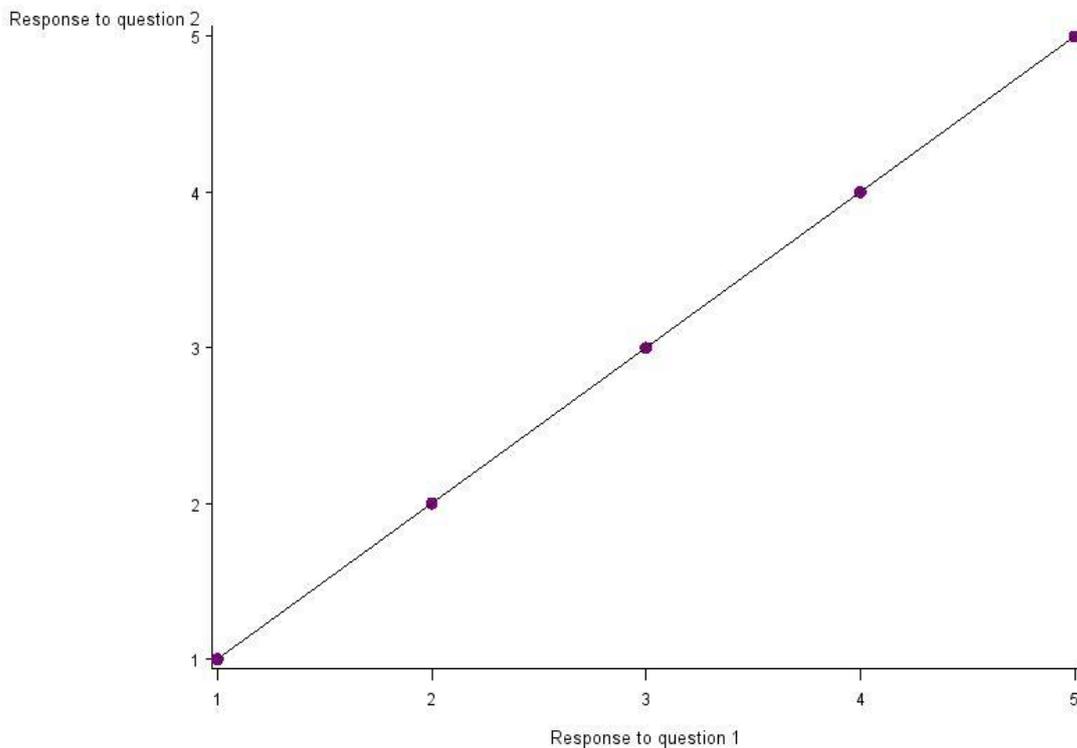
**Figure 31: Modelled difference in 'overall satisfaction' split by age group compared with those under 21**



## Correlation

16. Correlation considers the relationship between two variables. If there is a strong relationship, the variables are said to be highly correlated. Correlation can be either positive or negative, and has different strengths. The value with which two variables are correlated can be any number from -1 to 1. In this report, heat maps appear in the section headed 'Heat maps'. Perfect positive correlation might be illustrated by a scenario where only five respondents are being considered, and each gives the same answer to two questions, but the answer in each case is different. In other words, one respondent chooses 'definitely agree' for both questions, another 'mostly agree' for both questions, and so forth. This perfect positive correlation is illustrated in Figure 32.

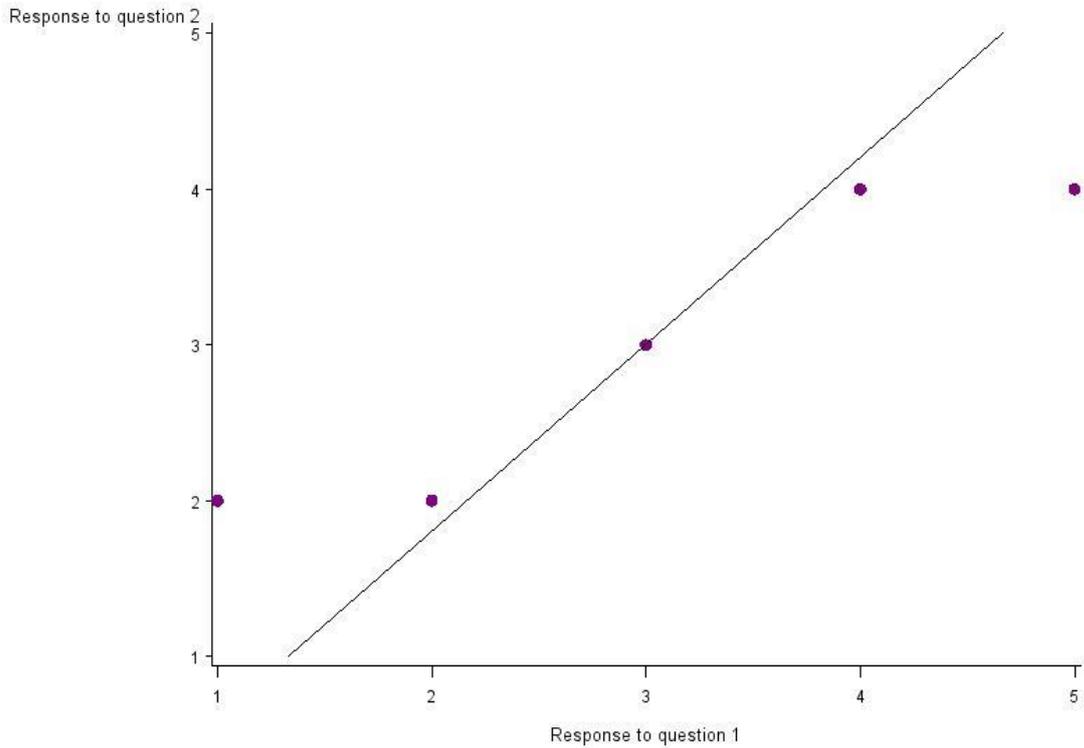
**Figure 32: Perfect positive correlation with a line of best fit**



17. The fact that the line of best fit runs from lower left to upper right shows that the correlation is positive. The fact that the line passes through the middle of every response shows that the data have a perfect correlation of 1.

18. Figure 33 illustrates a set of five responses with a strong, but not perfect, positive correlation.

**Figure 33: Strong positive correlation with a line of best fit**



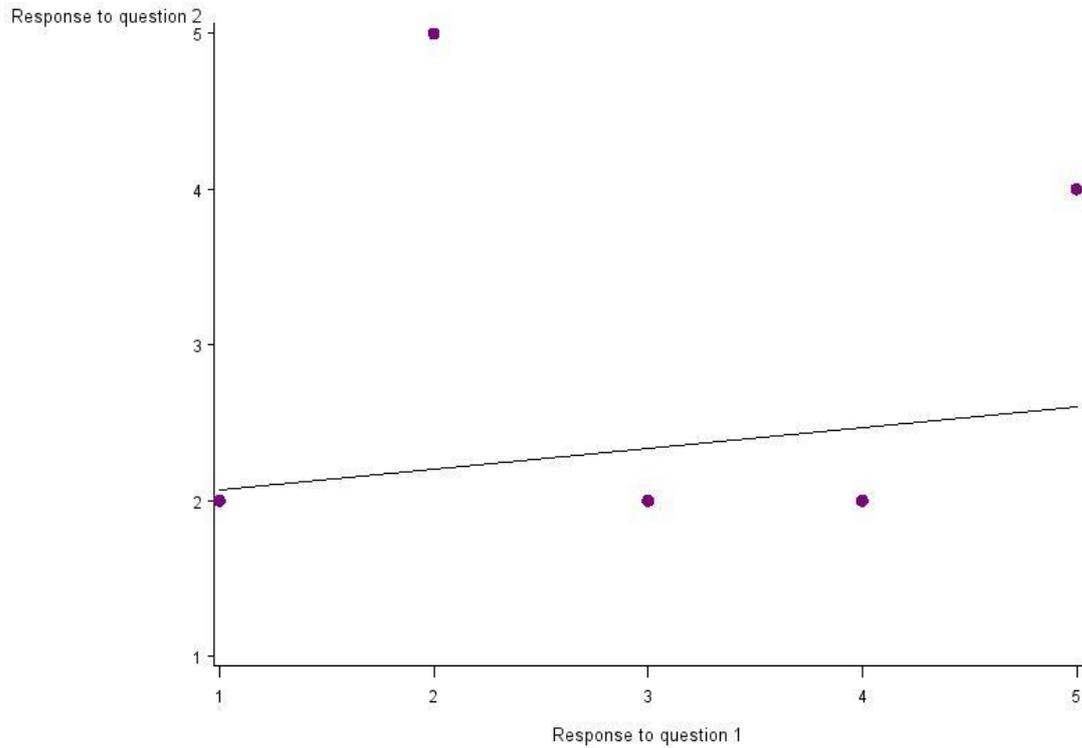
19. As in Figure 32, the line of best fit rises from left to right, indicating a positive correlation. The line also has a strong diagonal component, indicating that the correlation is strong. The correlation between the responses shown in Figure 33 is 0.9, which is very high. In the heat maps used to show correlation in this report, it would be shaded using the blue shown in Figure 34.

**Figure 34: Shading used for a correlation of 0.9**



20. A weak positive correlation would still involve the line of best fit rising from left to right but it would be much closer to the horizontal. An example of weak positive correlation is illustrated in Figure 35.

**Figure 35: Weak positive correlation with a line of best fit**



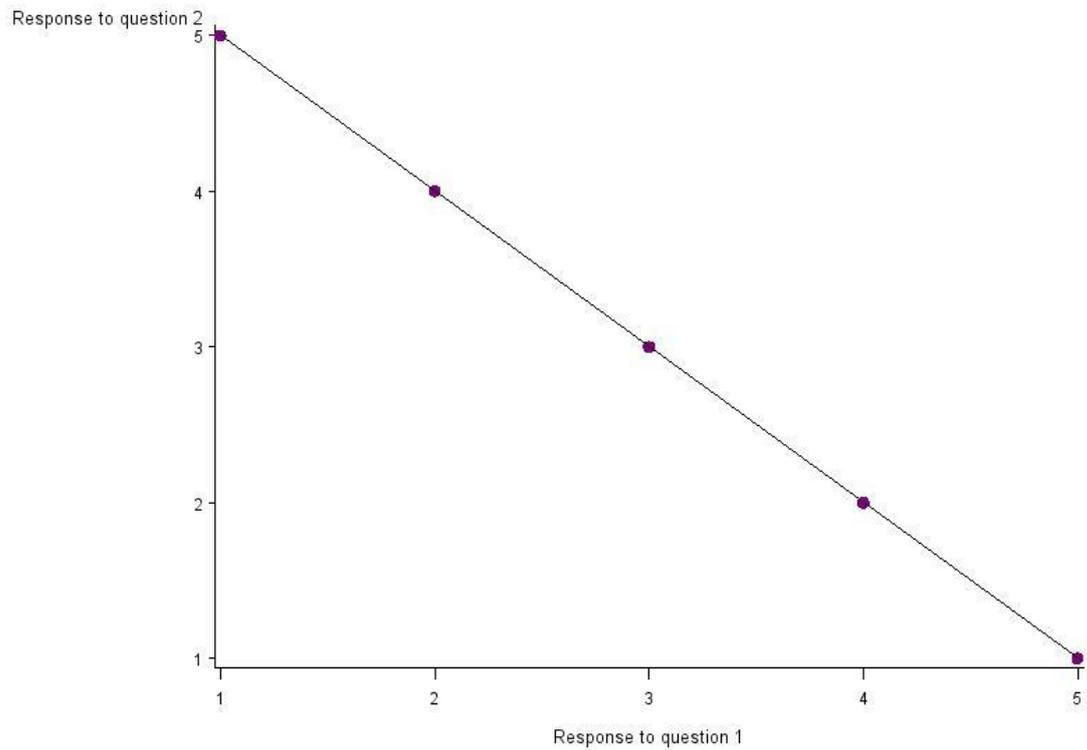
21. Figure 35 shows a much flatter line of best fit, indicating a weaker correlation. The correlation between responses to the two questions shown in Figure 35 is 0.1, which is very weak. It would be shaded in a heat map using the colour shown in Figure 36.

**Figure 36: Shading used for a correlation of 0.1**



22. In a negative correlation, the line of best fit declines from left to right. If five respondents gave opposite answers to two questions – with one respondent choosing 'definitely agree' to one question and 'definitely disagree' to the other, another respondent choosing 'mostly agree' to one and 'mostly disagree' to the other, and so forth – this would form a negative correlation. This is illustrated in Figure 37.

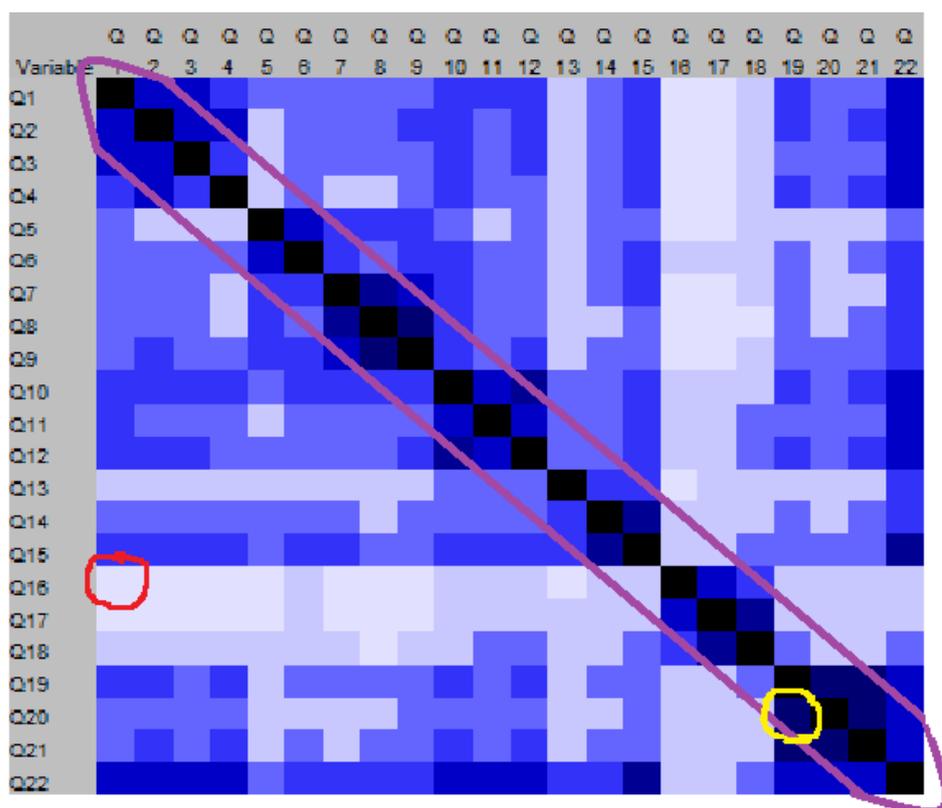
**Figure 37: Perfect negative correlation**



23. Although some of the NSS questions correlate less well than others, no pairs of questions are negatively correlated.

24. Figure 38 shows a correlation heat map which shows how closely correlated each question in the NSS is with every other question (in other words, the extent to which they have been answered similarly).

**Figure 38 – Heat map of NSS question correlations for the 2005 NSS results**



25. The square that shows the relationship between questions 1 and 16 (circled on the left in red) is shaded with a very pale blue. This means that the correlation between these two questions, although positive, is weak, and thus that the responses to these questions are not closely related.

26. The square that shows the correlation between questions 19 and 20 (circled to the right in yellow) has very dark blue shading. This implies that questions 19 and 20 are answered very similarly.

27. The correlation heat maps are symmetrical on either side of the leading diagonal (circled from top left to bottom right in purple). This means that only the upper right or lower left of the diagram need be considered.

### **Principal component analysis**

28. Principal component analysis is a statistical technique that can be used to reduce a large number of variables into fewer groups of related variables by drawing lines, known as principal components or factors, through the data. The first of these lines is drawn in such a way that it accounts for the largest possible variation in the data. ('Variation' describes how much the data are spread out.) The second line will account for the second largest variation and so on. Principal component analysis is discussed in this report under the heading 'Principal component analysis'.

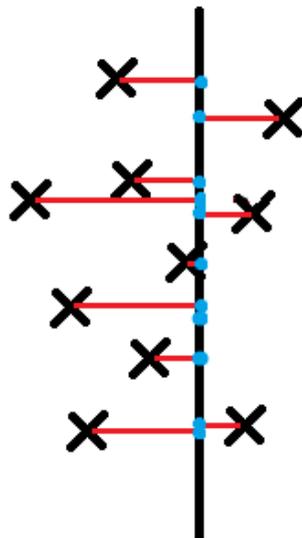
29. The example below helps to explain what is meant by variation. Figure 39 shows a series of data points forming an oval shape.

**Figure 39: Data points**



30. Figure 40 shows the same data, but with a vertical line drawn down the middle and the data points projected onto that line. The data point projections are marked by blue dots.

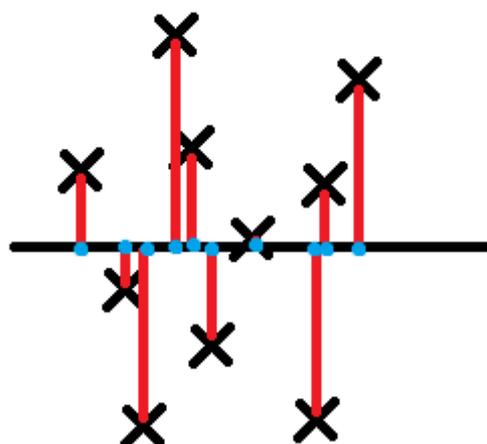
**Figure 40: Triangular data points projected onto a vertical line**



31. It is clear that the projections of the data points are fairly spread out along the vertical line: the distance between the blue dots at the top and bottom is long, and hence the variation is high.

32. Figure 41 shows the same data points, this time projected onto a horizontal line.

**Figure 41: Triangular data points projected onto a horizontal line**



33. The distance between the blue dots on the far left and right of Figure 41 is much less than the distance between the top and bottom dots in Figure 40. Therefore the variation displayed in Figure 40 is greater than that in Figure 41. To determine the principal component, the line which accounts for the most variation should be chosen: in this scenario, the vertical line shown in Figure 40.

34. The above is a two-dimensional example. Since the NSS contains 22 questions, a principal component analysis on the survey results will be considering the best lines to draw in 22 dimensions.

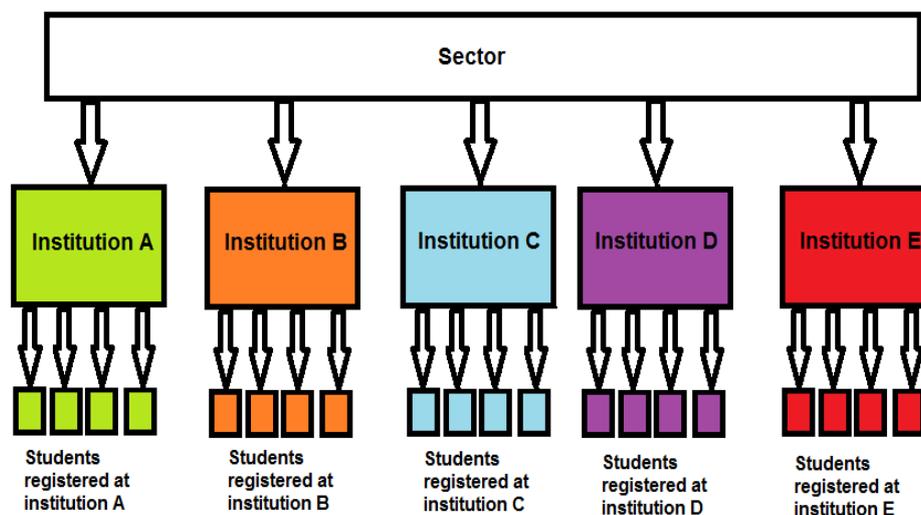
35. Since principal component analysis draws lines which cover the largest variation first, only the first few components need to be considered. In normal practice around 60 to 70 per cent of the variation in the data is covered by the principal components. In the case of the NSS, this means that it is reasonable to have five, six or seven principal components.

36. When carried out on survey data, principal component analysis is sometimes used to group questions together in each of the principal components. The way the principal components group the questions can sometimes be used as a basis for the survey structure, to ensure that similar questions are being asked together.

### **The structure of the model**

37. The model used to analyse the NSS result is a multi-level logistic regression model, which allows the data to be analysed at various levels. Figure 42 shows the structure of the multi-level model that is being used for this analysis. This is discussed in the report under the heading 'The model'.

**Figure 42 – Structure of the multi-level model**



38. As seen in Figure 42, the data are structured such that the sector results are split for each institution and each individual student within an institution can be considered. The unexplained variation in satisfaction for each institution can thus be calculated, by comparing the NSS results for a given institution with those of students with similar characteristics from the rest of the sector. For example, if institution A's students were less satisfied than similar students elsewhere in the sector, institution A would have an unexplained negative variation in its results.

39. The model is a logistic regression model, meaning that the outcomes are split into two groups. For example, when modelling the satisfaction of students those who either 'definitely agree' or 'mostly agree' with the statement of 'overall satisfaction' are grouped together, and modelled against the group of all those who gave other answers. To model the dissatisfaction of students, those who 'definitely disagree' would be compared with those who responded with any of the other four options.

### **Interpreting the modelling results**

40. This section explains how the modelling results used throughout this report have been interpreted. The results of the modelling allow an equation to be created that predicts the satisfaction of a respondent or group of respondents, given their characteristics and institution.

41. The results from modelling the 'overall satisfaction' question can be reconstructed into an equation. When the NSS results are inserted into this equation, it will give the actual percentage who agree for each characteristic (gender, ethnicity and so forth). For example, when all of the males are put into the equation, it calculates the 'overall satisfaction' of male respondents as 84.7 per cent.

42. Imagine that all of the other characteristics of the males are held to be the same, but the underlying data are changed such that all the males are now females. When this revised dataset is put into the model, it allows an expected percentage who agree to be

calculated for the modified group. The difference between the percentage who agree for the modified group and the original group will be the size of the effect associated with being male.

43. The corresponding percentage who agree for the modified male data is 84.9 per cent. There is a difference of 0.2 percentage points, so it can be determined that, compared with female students, male students are 0.2 percentage points less satisfied.

## **Annex B: Bibliography**

Boone 2012: Boone, D., Boone, H., (2012) 'Analyzing Likert Data', Journal of Extension, vol. 50, no. 2, April.

Friedman 1994: Friedman, H., Herskovitz, P., Pollack, S., (1994), 'The biasing effects of scale-checking styles on response to a Likert scale', Proceedings of the American Statistical Association Annual Conference: Survey Research methods, pp792-795.

Richardson 2005: Richardson, J., (2005) 'National Student Survey: interim assessment of the 2005 questionnaire'. HEFCE. (Online, accessed on 6 March 2014)  
[http://webarchive.nationalarchives.gov.uk/20120118171947/http://www.hefce.ac.uk/pubs/rdreports/2005/rd20\\_05/](http://webarchive.nationalarchives.gov.uk/20120118171947/http://www.hefce.ac.uk/pubs/rdreports/2005/rd20_05/)