

Office for  
Students



# National Student Survey 2020

Analysis of the impact of the  
coronavirus pandemic

Reference OfS 2020.37

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# National Student Survey 2020: Analysis of the impact of the coronavirus pandemic

1. This report explains how the Office for Students (OfS) assessed whether the reliability of the 2020 National Student Survey (NSS) was affected by the coronavirus (COVID-19) pandemic. The work has been carried out by the OfS on behalf of the UK funding and regulatory bodies of the NSS: the Department for the Economy in Northern Ireland, the Higher Education Funding Council for Wales, the Office for Students, and the Scottish Funding Council.
2. Interactive charts accompany the report. They are available on the OfS website in the form of a Tableau dashboard.<sup>1</sup> Readers will find it useful to have the dashboard open while reading the report.

## Background

3. Data collection for the 2020 NSS survey ran from 6 January to 30 April 2020. On 11 March, the World Health Organisation declared the coronavirus outbreak a pandemic. On 16 March, the UK government advised against non-essential contact with others, and suggested that people should work from home if possible. The UK 'lockdown' period began on 23 March.
4. The UK funders and regulators continued to run the survey during this period, but kept the decision under regular review. This was to allow all eligible students who had not yet responded the opportunity to do so. During the survey period, we monitored students' reactions to being asked to complete the survey, and this raised no particular concerns. Unlike in previous years, we did not use booster activity to raise response rates from higher education providers at risk of failing to meet reporting thresholds. This was to allow providers to concentrate on dealing with their responses to the pandemic.
5. On 7 May, the OfS, on behalf of all four funders, published a commitment to assess any impact of the coronavirus on the results, and to make professional judgments about its statistical reliability.
6. This paper explains our analysis and our findings. Our analysis aimed to:
  - a. Consider whether the data collection had been affected by the pandemic, such that the results were not comparable with previous years, or were not a reliable estimate for the whole population. For instance, this might have happened if much smaller proportion of students in the target population had responded to the survey.
  - b. Consider whether the students' reports of their experience had changed so significantly because of the pandemic that caution was needed in interpreting the results. This is in line with the Code of Practice for Statistics principle Q1.7: 'To evaluate the impact of changes in the circumstances and context of a data source'. For example, we aimed to consider whether responses to the survey made before and during the pandemic were so different that they should be presented separately, and removed from any NSS time series.

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<sup>1</sup> The interactive dashboard is available at [www.officeforstudents.org.uk/publications/nss-2020-analysis-of-impact-of-coronavirus-charts/](http://www.officeforstudents.org.uk/publications/nss-2020-analysis-of-impact-of-coronavirus-charts/).

7. Our analysis led to the conclusion that the results could be published in full, without any exceptional adjustment to account for the impact of the pandemic. This conclusion is discussed further in this report.

## Methods

8. Every year we carry out routine quality checks on the NSS data, to check that the survey remains fit for purpose. In addition to these routine checks, we carried out the following analysis to specifically assess the impact of the pandemic on the results.

## Analysis of the raw results over time

9. We examined the raw results over time to check whether any changes could be observed which might be due to the pandemic. We carried out this check for the 27 core NSS questions. We examined the results for the UK population as a whole, and split by nation, mode of study, domicile and subject of study.
10. The key value we examined for change was the 'agreement rate', which is the percentage of students who responded that they either definitely agreed or mostly agreed with the 27 NSS statements<sup>2</sup>. We also examined the percentage of students using the other response options, to check for changes that could be missed by focusing on the agreement rate alone.

## Statistical modelling

11. We used statistical modelling to examine whether there was a statistically significant difference between responses made before and after the pandemic took hold. The model is described in more detail in Annex A. In summary, it allows us to detect whether there was a significant change in agreement rates after a change point which, following a number of tests, we selected as 11 March (see paragraphs 14 to 17). The model takes the following factors into account: week of response, provider, age, sex, ethnicity, disability, subject, domicile, and mode of response (online or by phone). The model potentially allows us to detect changes that cannot be seen in the raw data because they are hidden by other patterns. For example, if students who respond later in the survey tend to be the sort of students who respond positively, this could hide a negative impact of the pandemic. Conversely, the model helps us understand whether changes in the raw data can be explained by factors other than the pandemic.

## Analysis of comments

12. We examined the open text comments submitted by respondents for references to the pandemic. We did this through an automated key word search, with a sample of comments manually checked to confirm that the automated search was appropriate. We used the analysis of the comments to understand: the extent to which students were focused on the pandemic when responding to the NSS; the point in time at which the pandemic became an issue for students; and the differential impact of the pandemic on providers.

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<sup>2</sup> The 2020 NSS questionnaire is available at the bottom of the OfS NSS webpage: [www.officeforstudents.org.uk/advice-and-guidance/student-information-and-data/national-student-survey-nss/](http://www.officeforstudents.org.uk/advice-and-guidance/student-information-and-data/national-student-survey-nss/).

## Consultation with providers and representative bodies

13. We consulted with a small number of providers and representative bodies from across the UK during a roundtable event to understand their perceptions of the impact of the pandemic, and the way it had affected the NSS survey. We used this discussion to test whether our early findings were consistent with the perceptions of the sector, and to understand whether our assumptions about how the pandemic might affect the data were consistent with theirs.

## Further notes on methods

### Selection of 11 March as the change point

14. As a first stage of analysis, we examined the raw data to see whether it showed a clear point when the responses changed in a way that seemed likely to be due to the pandemic. We first considered the key dates associated with the pandemic, which are:

- 11 March (the day the pandemic was declared by the World Health Organisation)
- 16 March (when the UK advised against non-essential contact with others)
- 23 March (the beginning of UK 'lockdown').

15. We determined that there was no clear change in the responses at or around these dates. We also considered the feedback from providers at our roundtable event: providers described moving teaching online during the second half of March. Some providers also described an initial challenging period following the 16 March announcement, followed by a return to calm in April as the new routine of online learning was established.

16. We then used our statistical model to assess whether there were statistically significant differences between responses made before and after each of these three dates when other factors were taken into account. This analysis found that a significant difference could be found regardless of which date was used. Finally, we conducted a Bayesian statistical change point analysis, which tested for other, less obvious change points in the data, and also for multiple change points (as might happen if the agreement rate dropped suddenly because of the pandemic and then recovered). This further analysis did not indicate any additional dates for testing. Further information about the Bayesian statistical change point analysis is included in [Annex A](#).

17. Since neither analysis nor consultation with providers yielded a clear change point, we opted to use 11 March. This was largely a pragmatic choice: as in previous years, a small proportion of students responded in the second half of the survey. We wanted to maximise the numbers of respondents after the change point, as on the whole, this would make it easier to detect any significant differences between the before and after groups. Throughout the analysis, we remained open to the possibility of alternative change points. We believe that the results presented in this report would be broadly the same had we used a later change point.

### Selections of question for detailed examination

18. Our analysis has examined the impact of the pandemic on all 27 of the core NSS questions. Occasionally, we have focused on a subset of questions as this has allowed a more detailed

analysis than would otherwise be possible. For these purposes, we selected the following questions:

- ‘9. Marking and assessment has been fair.’
- ‘15. The course is well organised and running smoothly.’
- ‘18. The IT resources and facilities have supported my learning well.’
- ‘19. The library resources (e.g. books, online services and learning spaces) have supported my learning well.’
- ‘20. I have been able to access course-specific resources (e.g. equipment, facilities, software, collections) when I needed to.’
- ‘27. Overall, I am satisfied with the quality of the course.’

19. These questions were chosen for a combination of reasons: in the case of Question 27, because of the attention it receives from users; for the other questions, either because the overall agreement rates showed a change from the previous year or because providers advised us that they were especially likely to have been affected by the pandemic.

20. We concentrated on the questions rather than the scales (groups of questions), as we were open to the possibility that the effect of the pandemic could be so unusual that it would affect a single question within a scale. We focused on the core questions rather than the NHS Practice Placement questions, as these are asked of a very limited subset of students and receive less attention from users. For the NHS Practice Placement questions, we determined that both response rates and agreement rates were broadly in keeping with previous years. The subset of students asked the NHS Practice Placement questions is considerably smaller this year, but this is for reasons unrelated to the pandemic: our definition of the population is already under review for NSS 2021.

## Findings

### Impact on reliability

#### Response rates

21. Response rates remained high at all levels of publication: the UK, the four nations, providers, and subjects within providers. [Chart 1](#) in the accompanying Tableau dashboard<sup>3</sup> shows that in the UK and each of the four nations, students continued to respond to the survey after 11 March. The UK final response rate for 2020 was 68.6 per cent, which compares with 71.9 per cent in 2019 and 70.1 per cent in 2018. It is hard to determine the extent to which the slight drop in response rates is due to the pandemic: the chart shows that the accumulation of responses in 2020 slowed after 11 March compared with 2019, but not compared with 2018. We only publish NSS results for a provider, or a subject within a provider, when a response rate of at least 50 per cent is achieved.

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<sup>3</sup> Chart 1: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart2?FiframeSizedToWindow=true&:embed=y>

22. Chart 2<sup>4</sup> examines the volume of publishable data in 2020, compared with previous years. In 2020, 93.3 per cent of providers have publishable provider-level results, compared with 96.1 per cent in 2019 and 97.7 per cent in 2018. Considering subjects within providers, the proportion of units meeting publication thresholds (at all three levels of the Common Aggregation Hierarchy (CAH)) remained broadly similar to previous years.<sup>5</sup> These charts also show that ‘truncating’ the data at or around 11 March to prevent potential distortion due to the pandemic would have substantially reduced the amount of publishable data. For example, if we had only used responses made before week 11 of the survey (the week during which the pandemic was announced) only 66.1 per cent of providers would have had publishable provider-level data.
23. We also considered response rates for students grouped by mode of study, subject, ethnicity, sex, domicile and disability. Response rates vary to some extent between groups, but similar variation is seen in previous years. We examined response rates over time for the same student groups to determine whether the pandemic had made it particularly hard for certain students to access the survey. The results are displayed in Chart 3<sup>6</sup>: it shows that the patterns of responses over time for each student group are broadly similar to those seen in previous years. To the extent to which a differential impact can be seen, it is on part-time students, whose response rate in the middle of the survey is similar to previous years, but then flattens off in a way that is not seen in 2018 and 2019. The final response rate for part-time students is 54.7 per cent, compared with 60.2 per cent in 2019 and 57.3 per cent in 2018.

## Mode of response

24. We examined the mode of response (phone or online) to determine whether this had changed because of the pandemic, and if so, how this might have affected the results. The NSS has become gradually less reliant on phone responses over time. In 2015, 23.6 per cent of responses were made by phone. By 2018 and 2019, this had reduced to 21.4 per cent and 19.4 per cent, respectively. In 2020, the proportion of phone responses increased to 24.2 per cent.
25. Chart 4<sup>7</sup> shows responses over time, split between online and phone responses. Compared with previous years, the volume of phone responses increased after 11 March. This is consistent with what we know about the impact of the pandemic. We understand that some providers scaled back promotional activity after 11 March. It is likely that this led to a drop in online responses. This in turn would have increased the number of phone responses, as the survey contractor attempted to call those who had not yet responded.

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<sup>4</sup> Chart 2: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart2?FiframeSizedToWindow=true&:embed=y>

<sup>5</sup> NSS results are reported at provider level and CAH1, CAH2 and CAH3 subject levels within each provider. For each of these units to be reportable they must have 10 responses and a 50 per cent response rate.

<sup>6</sup> Chart 3: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart3?FiframeSizedToWindow=true&:embed=y>

<sup>7</sup> Chart 4: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart4?FiframeSizedToWindow=true&:embed=y>

26. Table 1<sup>8</sup> shows the difference between the agreement rates for phone and online respondents over the past three years. The table includes the raw difference and the modelled difference. The modelled difference is an estimate of the difference that cannot be explained by other factors – such as the week of response and the characteristics of the student – and which may therefore be due entirely to the mode of response. For most questions, and for both raw and modelled results, phone respondents tend to be more positive than online respondents. For example, the modelled difference between phone responses and online responses for Question 27 is 6.1 percentage points. The maximum mode of response effect is seen for Question 26 ('The students' union (association or guild) effectively represents students' academic interests'), where the modelled positive difference between online and phone respondents is 9.4 percentage points.
27. Understanding the impact of the 4.8 percentage point shift towards phone responses is not straightforward, as the modelling also shows that the mode of response effect reduces later in the survey. Since the increase in phone responses took place in the second half of the survey, we cannot straightforwardly assume that these 'additional' phone responses display the mode of response effect described in paragraph 26 above. However, we can use these figures to approximate the maximum possible impact of the shift towards phone responses, as the additional proportion of phone respondents multiplied by the mode of response effect for the question. This yields 0.3 percentage points as the maximum possible increase for question 27, and 0.5 percentage points as the maximum increase for Question 26 (the question with the greatest mode of response effect).

### **Distribution of responses over time**

28. Across the sector as a whole, 21.2 per cent of responses were made on or after 11 March, but for providers with publishable data this ranges from zero per cent to 76.3 per cent. When we restrict to providers with at least 200 responses, the range becomes 3.1 per cent to 50.4 per cent. We assessed whether this difference could affect the reliability of the provider-level results. In particular, we were concerned to examine whether differences between providers might be introduced (or obscured) simply because of the distribution of their responses over time.
29. We began by comparing the actual agreement rate by provider with adjusted results. These adjusted results were calculated by weighting the respondents' full person equivalence (FPE)<sup>9</sup> so that, for each provider, 21.2 per cent of the total FPE was associated with responses made after 11 March. The results of this are shown in Chart 5.<sup>10</sup> From this we can see that the original agreement rates are generally very similar to the adjusted agreement rates.

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<sup>8</sup> Table 1: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Table1?FiframeSizedToWindow=true&:embed=y>

<sup>9</sup> The FPE value for each respondent is a proportion of their total study. A student studying a single subject will have an FPE of 1, but if they are studying two subjects their FPE will be split between them, with the proportions determined by the underlying Higher Education Statistics Agency student data or Individualised Learner Record data submitted by the provider. FPE is distinct from FTE (full-time equivalence) in that it is unrelated to the intensity of study: both a full-time and a part-time student will have in total an FPE of 1.

<sup>10</sup> Chart 5: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart5?FiframeSizedToWindow=true&:embed=y>



30. We then applied the model to both the raw results and the adjusted results, to determine whether a statistically significant difference could be found between responses made before and after 11 March (an '11 March effect'). As discussed in paragraphs 38 and 39 below, an 11 March effect is not necessarily due to the pandemic, because a similar time-related effect can be found in earlier years of the NSS data.
31. These results too are shown in [Chart 5](#).<sup>10</sup> On the whole, the 11 March effect remains constant in both the actual and the adjusted results: most providers with an 11 March effect in the actual results have an 11 March effect in the adjusted results, and vice versa. This suggests the presence of an 11 March effect is mainly independent of the distribution of responses over time for a provider. There are some exceptions. Focusing on Question 27, adjusting the data removes a positive or negative 11 March effect for five providers. We examined these five cases and determined that the change in significance had been triggered by a relatively small change in the confidence with which we could detect the effect.
32. In summary, it is possible that the distribution of responses over time may, in a small number of cases, introduce or hide an 11 March effect. However, this is marginal. It should also be noted that this is not an issue purely related to the pandemic, since the 11 March effect is present in previous years. If anything, the distribution of responses over time is a more general source of potential error, but with small effects that are hard to detect with confidence.

## Impact on sector results

33. As well as examining whether the pandemic had affected the survey to make the results less reliable, we examined the results themselves. We were particularly interested in determining whether the results had changed in such a way that care was needed in their use or presentation.

## Raw results

34. We found that there is no obvious change in the agreement rate (the proportion of students responding 'strongly agree' or 'mostly agree') that can be attributed to the pandemic. This can be seen in [Chart 6](#),<sup>11</sup> [Chart 7](#),<sup>12</sup> [Chart 8](#)<sup>13</sup> and [Chart 9](#).<sup>14</sup> The agreement rate varies over time, particularly for certain questions. But this variation is present in 2018 and 2019 as well as in 2020. This finding holds true at the sector level, for each of the four nations and for students grouped by domicile, subject of study and mode of study.
35. As noted in paragraph 10 above, we focused in this analysis on the agreement rate, as this is the statistic most commonly used and reported on. However, we also checked the proportion of students offering each of the five responses, in case there were changes that were not visible in the agreement rate. Compared with 2019, we found a larger decrease in the 'strongly agree'

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<sup>11</sup> Chart 6: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart6?FiframeSizedToWindow=true&:embed=y>

<sup>12</sup> Chart 7: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart7?FiframeSizedToWindow=true&:embed=y>

<sup>13</sup> Chart 8: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart8?FiframeSizedToWindow=true&:embed=y>

<sup>14</sup> Chart 9: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart9?FiframeSizedToWindow=true&:embed=y>

proportion for some questions than the decrease in the agreement rate. However, through examining the responses over time we determined that this effect is present both before and after 11 March so cannot be attributed to the pandemic.

## Modelled results

36. We used the model to determine whether there was a significant difference between responses made before and after 11 March (an '11 March effect') when other factors were taken into account. The model found that there is a significant difference for the majority of questions, but that this is also present in 2018 and 2019, so cannot be attributed solely to the pandemic. In 2020, the difference is positive: students responding after 11 March have an increased chance of agreeing with the NSS statements. In 2018 the effect is also positive, whereas in 2019 it is negative. Further information about the modelling is provided in [Annex A](#).

## Comments

37. We examined the volume of comments mentioning the pandemic, as a way of understanding the extent to which it was in students' thoughts as they responded to the survey. These comments are shown over time in [Chart 10](#).<sup>15</sup> We were able to detect around 3,100 comments that mentioned the pandemic, which amount to 1.6 per cent of all comments. The NSS allows respondents to make both a positive and a negative comment about their student experience. The majority of comments mentioning the pandemic were offered as negative, but some were positive. [Chart 10](#) also shows that the volume of comments mentioning the pandemic begins to increase on 11 March, which confirms this as a reasonable date for the 'change point' (as discussed in paragraphs 14 to 17 above).

## Impact on provider results

### Presence of an 11 March effect

38. We examined the raw provider agreement rates over time to see whether there were substantial differences between responses submitted before and after 11 March. In some cases, differences can be seen, but it is not straightforward to attribute these to the pandemic. The students responding later in the survey tend to differ from earlier respondents in personal characteristics, course characteristics and mode of response. These differences, rather than the pandemic, may be responsible for the differing agreement rates.

39. To assess this, we applied the model to the individual provider results to find out whether there was a statistically significant difference between results submitted before and after 11 March, when these additional factors were taken into account. For Question 27, we found a significant difference (an '11 March effect') for 30 providers. However, we also found the same effect in the two previous years, and for similar numbers of providers (30 in 2019 and 17 in 2018). This supports a similar conclusion as for the sector level results: we cannot say with confidence that the pandemic has affected the provider-level results.

## Volume of change

40. We also considered the extent to which provider-level results had changed from the previous year. We were interested to know whether 2019-20 was a particularly volatile period as a result

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<sup>15</sup> Chart 10: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart10?FiframeSizedToWindow=true&:embed=y>

of the pandemic. If so, we might have considered advising caution in the use of the statistics. In particular, we might have warned against using the results to draw more general conclusions about the student experience outside the time period covered by the survey.

41. For each provider, we calculated the change in the agreement rate between the following pairs of years: 2017 and 2018; 2018 and 2019; 2019 and 2020. The results are shown in [Chart 11](#).<sup>16</sup> We found that the volume of change is broadly similar for each of these pairs. In all cases, positive or negative changes of greater than 5 percentage points are unusual, and most providers see no year-on-year change. In all pairs of years, there is a long ‘tail’ of providers that see substantial changes from one year to another. From 2018 to 2019, these changes are more likely to be positive, whereas from 2019 to 2020 they are more likely to be negative. This is consistent with what we see at a sector level: a small negative shift from 2019 to 2020 in the agreement rate for some questions.

### Comments by provider

42. We analysed the comments to determine how they are spread between providers. A clustering of comments in a particular provider would suggest that the pandemic was having an impact. We found that for all providers, the proportion of comments that mention the pandemic is low, ranging from zero per cent to 5.7 per cent. The range remains the same even when we focus on larger providers with at least 200 respondents.

## Impact on subjects within providers

### Presence of an 11 March effect

43. The NSS results are also published at the level of subjects within providers, where the subject groupings are levels 1, 2 and 3 of the Common Aggregation Hierarchy (CAH1). We applied the model to Questions 9, 19 and 20 (using CAH1) and the model found only a minimal 11 March effect: five cases for Question 27 in 2020, compared with two in 2019. To some extent this will be due to the small numbers within units under consideration, which make it harder to detect significance.

### Volume of change

44. We considered the extent to which the outcomes by subjects within providers had changed from the previous year, focusing on CAH3 split by mode of study (the lowest level unit used in the NSS publication). As with the provider level results, we were concerned to see whether the results were more volatile than usual, as this would suggest that they should be used with caution. Our findings are shown in [Chart 12](#)<sup>17</sup> and [Chart 13](#).<sup>18</sup> Chart 13 shows the volume of change measured by the number of students in the publication unit. Chart 12 takes the number of publication units as the measure.
45. We found that, as with the provider-level results, the volume of change between 2019 and 2020 was broadly similar to that seen in the two previous pairs of years. For some questions,

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<sup>16</sup> Chart 11: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart11?FiframeSizedToWindow=true&:embed=y>

<sup>17</sup> Chart 12: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart12?FiframeSizedToWindow=true&:embed=y>

<sup>18</sup> Chart 13: <https://tableau.hefce.ac.uk/t/Public/views/NSSCOVID-19/Chart13?FiframeSizedToWindow=true&:embed=y>

the agreement rate has shifted in a negative direction. Looking at question 15, the largest number units saw a 2019 to 2020 change of -4 percentage points. However, this is not exceptional volatility: an extremely similar shift was seen between 2017 and 2018. The curves for the part-time units are less obviously well aligned and contain more peaks and dips than the full-time charts. This, though, is explained by the smaller numbers of students and courses, which make random variation more likely.

## Conclusions

46. Our review of the data led us to conclude that the results could be published in full, and without any adjustment. We reached this conclusion because we did not find evidence that the reliability of the statistics had been affected by the pandemic. Neither did we find evidence that the results had been strongly impacted by the pandemic, to the extent that exceptional caveats or adjustments were needed. While our analysis uncovered some potential issues with the results, such as the mode of response effect and the variable response rates across student groups, these are all variations on themes present in previous years. We will continue to assess these and to explore possible mitigations as part of our routine work to maintain and develop the NSS.
47. For completeness, we list below the possible adjustments to publication that we considered and rejected.

## Measures considered and rejected

- Truncating the results on, or around 11 March so that the published data would present the student experience before the pandemic. We saw no case for doing this. In addition, truncating the data would substantially reduce the number of publishable units, and would introduce distortion by excluding responses from particular student groups.
- Lowering response thresholds to ensure that enough data was publishable. We rejected this as unnecessary by observing that response rates remained high, and that the number of publishable units had not greatly reduced. Lowering the response thresholds would increase the risk of non-response bias, and while there are strategies for addressing this (such as weighting the results) we could not explore and implement this without compromising the timeliness of the statistic. (Timeliness is particularly important for the NSS, as we aim to have the results available for prospective students as they finish their Level 3 qualifications and consider higher education.)
- Adjusting the results to compensate for the increased proportion of phone responses. We rejected this option on the grounds that the possible distortion to the data is very small. While it would be possible to correct it, any adjustment would need to make further assumptions which would themselves be datable. There is a substantial risk that adjusting the data in this way would cause damage without significant improvement.
- Adjusting the provider-level data to eliminate the effect caused by the distribution of responses over time: this would, in effect, ensure that the exposure to the pandemic was kept as constant as possible across providers. Given the minimal impact of the distribution of response over time, we found this unnecessary. In addition, we noted that any such adjustment would be

contestable and that there was a substantial risk of causing more harm than benefit, as well as confusing users.

- Publish a warning or caveat alongside the results, signalling that they should be used with caution since they are highly atypical. We did not find grounds for doing this, given that our analysis suggests that the extent to which the results differ from previous years is entirely within the expected range.

# Annex A: Statistical modelling methodology

## Modelling the 11 March effect

1. To estimate the relationship between an '11 March effect' and the probability of responding positively to one of the NSS questions, while controlling for other factors, we estimate a multi-level logistic regression model. The model contains observations at the level of student  $j$  who studied at provider  $i$ .

2. The model equation is:

$$\begin{aligned} \text{logit}(Y_{ij}) = & \beta_{0ij} + \beta_1 \text{year}_{ij} + \beta_2 \text{week}_{ij} + \beta_3 \text{week}_{ij} * \text{week}_i + \beta_4 \text{week}_{ij} * \text{week}_{ij} * \text{week}_{ij} \\ & + \beta_5 \text{11th March}_{ij} + \beta_6 \text{age}_{ij} + \beta_7 \text{sex}_{ij} + \beta_8 \text{ethnicity}_{ij} + \beta_9 \text{disability}_{ij} \\ & + \beta_{10} \text{subject}_{ij} + \beta_{11} \text{domicile}_{ij} + \beta_{12} \text{method of response}_{ij}. \end{aligned}$$

3. Where  $\beta_{0ij} = \beta_{0i} + u_{0i}$  and  $u_{0i}$  is the random effect for provider ( $i$ ). These random effects are assumed to be normally distributed with a mean of 0 and a variance of  $\sigma^2$ .  $Y_{ij}$  is a binary response variable which takes the value of 1 if the response to a question is positive (4 or 5) or 0 otherwise. The interaction of week of response with itself to give quadratic and cubic terms is included to try to give the best fit to how responses vary across the collection period.

4. The 11 March variable indicates whether a student responded to the survey before or after 11 March in 2020. This is used to consider whether the probability of giving a positive response changed after the date on which the pandemic was declared by the World Health Organisation. However, as well as looking at whether this effect is present in 2020, we also wanted to check whether this effect was present in 2019 or 2018. Therefore, the model has also been run with variables relating to the period after 11 March 2019 (for the 2019 survey data) and 11 March 2018 (for the 2018 survey data).

5. We have run other versions of the model including:

a. A random effect for the 11 March effect by provider.

b. Interactions between the 11 March effect and age, disability and sex to assess whether particular student groups were differently impacted by the 11 March effect.

c. Interaction between 11 March effect and the mode of response effect, as well as analysis to enable us to understand the magnitude of the mode of response effect and whether this was particularly different in 2020.

d. Inclusion of a country of provider effect and interaction of this term with the 11 March effect, to understand whether providers across the four nations had a different relationship with the 11 March effect.

6. A different effect has also been considered around 11 March by splitting responses into those before 11 March, those in the two weeks following 11 March, and those later in the collection. This sought to examine whether there was a kind of 'shock' period during which responses were different before returning to the pattern seen previously.

## Change point analysis

7. In the original model equation, the 11 March 2020 date is assumed to be fixed. In our Bayesian change point analysis, this date is assumed not to be fixed but to be restricted to a particular date range. We do this by placing a non-diffuse prior distribution on the 11 March 2020 value (in this case a uniform distribution that is restricted between 4 March and 25 March). We fit this model via a Markov Chain Monte Carlo estimation approach with appropriate diffuse priors on our model variables (the beta and appropriate sigma terms).



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