Redacted - section 38(1)(b)

From: [redacted] on behalf of Fiona Robertson
To: DFMCSE@gov.scot
Cc: DirectorofLearning@gov.scot
Subject: Letter from Fiona Robertson, SQA Chief Executive and Scotland"s Chief Examining Officer
Date: 04 August 2020 09:48:00
Attachments: SQA NQ 2020 Awarding - Methodology Report - 4 August 2020.pdf
Letter - Fiona Robertson to the Deputy First Minister - SQA alternative approach to certification 2020 - 4 August 2020.pdf
Importance: High

PS/DFM

Please find attached letter and methodology report from Fiona Robertson, for the attention of the Deputy First Minister.

Kind regards,

[redacted] Fiona Robertson, Chief Executive
Scottish Qualifications Authority

Scottish Qualifications Authority
Ùghdarras Theisteanas Na H-Alba

4 August 2020

John Swinney MSP
Deputy First Minister /
Cabinet Secretary for Education and Skills
The Scottish Government
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EH1 3DG

By email: DFMCSE@gov.scot

Contact: Fiona.Robertson@sqa.org.uk

Dear Deputy First Minister

On 18 March you asked me, as Chief Examining Officer, to develop an alternative approach to certification this year following the closure of schools and the cancellation of exams.

I am writing today to set out the approach we have taken, drawing on my report as Chief Examining Officer. This report, together with a suite of supporting documentation, is being published in full at 09:30 this morning.

Since the outset, our approach has been based on three core principles, which reflect both how we work and the circumstances of 2020:

- Fairness to all learners.
- Safe and secure certification of our qualifications, while following the latest public health advice.
- Maintaining the integrity and credibility of our qualifications system, ensuring that standards are maintained over time, in the interests of learners.

On 20 April, I set out the four key stages to our approach: estimates; awarding; results and certification; and appeals.

The key input to our alternative certification model has been based on estimated grades. We receive estimates every year from schools and colleges. We asked for more detailed estimates — 19 refined bands — and candidate rank order within these refined bands, to provide more differentiated data to inform the awarding process. Teachers, lecturers and partners from across education helped inform the approach and the guidance.

The estimates we received were significantly above previous A to C attainment at National 5, Higher and Advanced Higher: A to C attainment rates were 10.4 percentage points higher at National 5, 14.0 percentage points higher at Higher and 13.4 percentage points higher at Advanced Higher than results in 2019. As the national awarding body, with responsibility for maintaining the integrity and credibility of our qualifications system, and ensuring that standards are maintained over time, the estimates highlighted a clear case for moderation. Overall, there was variation, but not uniform variation, between historic attainment and 2020 estimates across subjects, levels and centres.

The moderation process was undertaken at centre level, per course, and by grade using historic attainment data. Starting Point Distributions, with tolerances, set out the expected parameters for each grade and A to C attainment nationally in 2020, drawing on historic attainment, prior attainment data (where available), and feedback from SQA Qualifications teams and Principal Assessors.

For centres which had no historic attainment data for a course, estimates were accepted without moderation as there was no fair or evidential basis on which they could be adjusted.

As you know, we considered very carefully whether to conduct a professional dialogue with schools and colleges as part of the moderation process. It was concluded that it would not be possible to include engagement with centres. The reasons for this are twofold:

- The difficulty of operating a dialogue that was fair and consistent in its treatment of all centres and candidates.
- The time that would be required in what was already a very tight schedule for certification.

Of 511,070 entries across National 5, Higher and Advanced Higher, we accepted 377,308 (73.8%) estimated grades and 133,762 (26.2%) estimated grades were adjusted.

Given the profile of estimates, most of the adjustments — 124,564 or 93.1% — were moderated down, and 9,198 entries (6.9%) were moderated up. Of the total 133,762 adjustments, 128,508 or 96.1% were adjusted by one grade. 45,454 entries (8.9%) were adjusted down from grades A–C to grade D or to No Award. Of these, 43,423 (95.5%) were originally estimated to be grade C.

Full details of our methodology is provided in the SQA National Qualifications 2020 Awarding – Methodology Report, attached. Further information on the moderation outcomes for each of the 129 courses across National 5, Higher and Advanced Higher is also being published today.

Our post-certification review (appeals) process will provide for further, evidence-based consideration of grades if schools and colleges do not think awarded grades fairly reflect candidate performance. The new system goes live today.

Looking at outcomes, A to C attainment in 2020 at National 5 is 243,572 or 81.1% (225,594 or 78.2% in 2019). At Higher it is 146,643 or 78.9% (138,972 or 74.8% in 2019). At Advanced Higher it is 20,010 or 84.9% (18,627and 79.4% in 2019).

Some variation of attainment is to be expected between courses and over time. This year, the absence of external assessment information and the moderation process has led to more significant movements in attainment than we would see in a normal year.

Throughout the development of the model we have had equalities at the heart of our thinking, and have developed and refined an Equality Impact Assessment and a Child Rights and Wellbeing Impact Assessment to inform our approaches and decisions, as well as to demonstrate our compliance with our statutory obligations. In developing these assessments, we have had due regard to the potential equalities impacts of our processes and have sought to ensure that our guidance to centres on equalities in the estimation process assisted them in fulfilling their equalities' responsibilities. Whilst the moderation process involved the use of pseudonymised data, we have ensured that the arrangements we have in place for post-certification review and exceptional consideration arrangements are also designed to address any cases of discrimination in original estimation by centres.

Our statistical analysis of available data (contained in the Equality Impact Assessment) from 2016 onwards demonstrates that, after moderation, learners in the most deprived SIMD bandings saw attainment levels for grades A to C higher than both 2019 results and the average result for 2016-2019 as well as a narrowing of the attainment gap between those in the most deprived and least deprived SIMD bandings over the same periods. We have also engaged with the Scottish Government to undertake further statistical analysis on protected characteristics, the data for which is held by them.

To conclude, this has been a very challenging year for everyone involved in Scottish education. I am very grateful to schools and colleges across Scotland who have worked with us in the most difficult circumstances to deliver for learners. Without teacher and lecturer estimates, we would not have been able to certificate this year.

I am also grateful for the patience of Scotland's learners who, together with their families, have been worried about what the cancellation of exams might mean. The results young people across Scotland receive today should reflect their achievements and allow them to progress to further study or employment.

Finally, I must thank SQA staff who have worked so hard to deliver. I believe we have:

- Delivered fairness to learners, through a consistent, evidence-based approach to awarding, supported by an Equalities Impact Assessment and a Child Rights and Wellbeing Impact Assessment.
- Ensured safe and secure certification of our qualifications, taking difficult decisions when needed, following public health advice.
- Maintained the integrity and credibility of our qualifications system, ensuring that standards are maintained over time, in the interests of learners, through judicious moderation of grades.

Yours sincerely

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Fiona Robertson

Chief Executive and Scotland's Chief Examining Officer

Technical Report

National Qualifications 2020 Awarding — Methodology Report

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Contents

1 Setting the scene

SQA considered a range of options around determining candidate entitlement to graded National Courses in 2020 as a result of the impact of the COVID-19 public health emergency. As a consequence of the cancellation of national examinations, announced on 19 March, an alternative certification model (ACM) has been developed and implemented to allow SQA to award these qualifications as fairly and reliably as possible — over time, across subjects and levels — given the current circumstances and in the absence of any candidate performance assessment information.

Our approach is made up of four steps:

- Step 1 — Estimates
- Step 2 — Awarding
- Step 3 — Results and certification
- Step 4 — Appeals

This report describes the second step of the model, awarding.

The core element of the ACM is teacher and lecturer estimates, moderated by SQA. Moderation is a process to ensure that the assessment outcome — the grade — is fair, valid and reliable and to ensure consistency of teacher and lecturer assessment judgements across centres. Centres have provided estimates based on the normal band scale of 1–9, estimates based on a refined band scale of 1–19, and a rank order of candidates within each refined band.

This technical report outlines the work undertaken since early March 2020 to determine candidate entitlement to graded National Courses in 2020 as a result of the decision not to run the diet of examinations in 2020. The work outlined in this report highlights the challenges of relatively low-uptake qualifications at national and centre-levels, limited prior attainment information, and the absence of assessment data based on candidate performance in examinations and coursework. This meant that SQA was limited in adopting a purely statistical approach to moderation. The data we have in 2020 includes estimates, rank orders, and prior attainment data for a substantial proportion of Higher and Advanced Highers. In addition, we have historical data, including estimates, and actual results by subject and centre.

The outcomes of this year's awarding process were for SQA to award grades A, B, C, D and No Award as normal. The moderation of centre estimates is designed to ensure that the grades awarded to candidates are as fair as possible and that national standards are maintained.

The timeline outlined in appendix 2 provides an indication of how SQA has proactively responded to this evolving issue including the refinement of the ACM.

Equality and fairness considerations

In parallel with establishing the overall ACM, SQA has developed an equality impact assessment of the full end-to-end process to ensure it considered and sought to mitigate the

potential for any aspect of the moderation approach to unfairly impact on one or more groups of candidates with protected characteristics.

Whilst this technical report includes reference to equalities considerations related specifically to the methodology adopted, it should also be read in conjunction with the *2020 Alternative Certification Model — Equality Impact Assessment*.

2 Guiding principles

Three guiding principles have underpinned our approach to developing and implementing the ACM for 2020:

- fairness to all learners
- safe and secure certification of our qualifications, while following the latest public health advice
- maintaining the integrity and credibility of our qualifications system, ensuring that standards are maintained over time, in the interests of learners

3 Business-as-usual approach to awarding

3.1 Setting grade boundaries

SQA has a responsibility to individual learners and to the wider community to ensure that the standard of our qualifications is set appropriately and maintained over time and across courses. This means that we have to make sure that the grade a candidate receives recognises achievement against the knowledge, skills and understanding requirements of the course. It also means that we have to make sure that it is not easier or harder to achieve the same result across different courses.[1]

This is achieved through the development of course assessments based on an assessment 'blueprint' and consistent application of detailed 'fit-for-purpose' marking schemes through quality-assured marking processes. Finally, during awarding meetings each year grade boundaries are set following a consideration of a range of qualitative and quantitative information, for the current year and the three previous years. The boundaries set are: upper A (band 1), lower A (band 2) and lower C (band 6). All other grades and boundaries are automatically calculated based on these boundaries. There is no other mechanism currently used for setting grade boundaries. Our approach to awarding is discussed and approved each year at SQA's Qualifications Committee.

The combination of the above activities provides SQA with the confidence to award graded National Courses.

SQA does not operate an explicit norm-referenced system where a fixed-proportion of grades is awarded each year. Awarding meetings are held individually and there is no process to shape national level performance. However, the approach does result in a relatively stable national system as outlined in the tables below. Subject-by-subject variability is acknowledged, for example, the results for larger uptake qualifications are more stable over time than those for lower uptake qualifications.

Table 1: National 5 A–D distribution (2016–19)

National 5					
	A	**B**	**C**	**D**	**A–D**
2019	35.2%	23.8%	19.3%	12.5%	90.8%
2018	35.2%	23.0%	19.3%	12.3%	89.8%
2017	37.2%	23.8%	18.6%	6.5%	86.1%
2016	36.6%	23.7%	19.2%	6.6%	86.1%
Extended grade D scale from Diet 2018					

1 A Guide to Setting Grade Boundaries

Table 2: Higher A–D distribution (2016–19)

Higher					
	A	**B**	**C**	**D**	**A–D**
2019	28.5%	24.0%	22.4%	15.0%	89.9%
2018	28.7%	25.3%	23.1%	8.7%	85.8%
2017	29.0%	25.5%	22.8%	8.3%	85.6%
2016	29.5%	25.2%	22.8%	8.3%	85.8%
Extended grade D scale from Diet 2019					

Table 3: Advanced Higher A–D distribution (2016–19)

Advanced Higher					
	A	**B**	**C**	**D**	**A–D**
2019	32.0%	24.9%	22.7%	8.3%	87.9%
2018	32.6%	25.9%	22.3%	7.9%	88.7%
2017	32.0%	25.6%	22.8%	7.9%	88.3%
2016	33.8%	25.9%	22.4%	7.4%	89.4%
Extended grade D scale from 2020					

The year-on-year stability outlined in the above tables suggest that the setting of national distributions in 2020 based on a consistent historical-based approach is possible. However, subject-by-subject variation may need to be considered. The types of situations where a consistent historical-based approach may not be appropriate include the following:

1 Where SQA has made a significant or material change to course assessment in that period.
2 Where there was a significant adjustment in the period due to a non-functioning assessment component.
3 Where there was a ‘reset’ of standard.
4 Where the actions of one centre with significant presentations in a small cohort served to skew the decision-making or distribution.
5 Low-uptake courses.
6 New centres.

However, only making national-level adjustments to grades may advantage or disadvantage some centres who have estimated differentially in 2020. Therefore, the first step in the awarding process for 2020 should be an exercise to moderate centre estimates to address differences in estimation approach, as far as possible. The last step in this year’s awarding process should be a national awarding review of the resulting national distribution.

National Courses

Graded National Courses (National 5, Higher and Advanced Higher) are assessed through a combination of coursework and/or question papers as outlined in the relevant course specification. However, in prescribed circumstances other existing processes, eg exceptional circumstances, may overwrite these assessment requirements. There were 128 graded National Courses in 2019, as outlined in Table 4.

Table 4: Graded National Courses (Diet 2019)

Level	Number of subjects
National 5	48
Higher	46
Advanced Higher	34

3.1.1 Historical presentation patterns across centres

Entry patterns for the SQA National Course portfolio are characterised by high- and low-uptake qualifications and new, returning or very low-uptake centres. For example, in Diet 2019 national level entry figures varied across National 5 from 87 (Urdu) to 46,626 (English), across Higher from 62 (Gaelic) to 36,205 (English), and across Advanced Higher from 11 (Gaelic (Learners)) to 3,635 (Mathematics). Advanced Higher has very low national entry numbers in some subject areas.

At a centre level, even for large entry subjects, entry levels can vary significantly. In 2020, the greatest number of entries at centre level for National 5 was for Mathematics, but entry levels ranged across centres from 1 to 337 (average 97). For Higher, the greatest number of entries at centre level was for English, ranging across centres from 1 to 317 (average 88). For Advanced Higher, the greatest number of entries at centre level was for Mathematics, with a range across centres from 1 to 70 (average 11).

A significant proportion of courses have entries of 25 or less. This presents particular challenges. In Diet 2019, there were 21,488 distinct centre/subject/level combinations entered for National Courses (National 5, Higher and Advanced Higher). 15,588 (73%) of these distinct centre/subject/level combinations had 25 or fewer candidates entered and resulted. Table 5 breaks this down by level.

Table 5: Centre/subject/level combinations (Diet 2019) by level

	Overall	25 or fewer candidates
National 5	9,126	5,539 (61%)
Higher	8,077	6,176 (73%)
Advanced Higher	3,924	3,873 (99%)

In 2019 for National 5, at least half of class entry sizes were made up of 19 or fewer candidates; for Higher, at least half of class entry sizes were made up of 14 or fewer candidates; and for Advanced Higher, as least half of class entry sizes were made up of four or fewer candidates. Relatively small numbers of candidates distributed across many centres means it is challenging to make statistically significant decisions across centres and nationally in some low-uptake subjects. This has significant implications for the use of a purely statistical approach for centre moderation purposes for this year's ACM.

4 2020 decision-making data

Whilst it was clear from the announcement on 19 March that examinations would not take place, immediately after schools had closed, SQA had anticipated that coursework, a core element of our qualifications, could be completed and marked. However, due to public health advice it quickly became clear that was not possible. SQA announced on 24 March that schools and colleges were not required to submit learner coursework for marking in Higher and Advanced Higher courses. In addition, all other National 5 coursework due to be uplifted in April and May was not submitted for marking as candidates could not complete work safely. While considering the required arrangements, it became clear that we could no longer proceed with the marking of the National 5 coursework in a safe and secure manner. It was not therefore possible to include coursework data in the awarding approach.

In the absence of any data from candidate performance in examination or coursework, SQA was required to focus on other sources of data as the basis for the awarding approach.

SQA decided to request a more granular estimate scale and rank order to support more nuanced decision-making — in the absence of candidate marks — through the stages of the ACM. Requests for both an extended estimate scale and rank order were made to address two important aspects of accuracy of teacher estimation, ie absolute accuracy where the actual grade a candidate achieves is estimated against a national standard, and the rank order which is a relative accuracy judgement in the sense that, while it is not possible to determine the actual grade, it is possible to rank candidates in a class relative to each other.

SQA asked for both teacher and lecturer estimates and rank orders to ensure that we had the maximum amount of information available to inform decisions on grades for individual candidates and the required quality assurance process.

4.1 Estimates

Use of estimates in business-as-usual awarding

This section covers the use of estimates in SQA's business-as-usual awarding processes and in 2020.

As a matter of course, teachers and lecturers are asked to submit estimated grades for their candidates. Other than the skills of the estimator, the 'accuracy' of estimates is dependent on three main variables:

- valid evidence of performance in a centre to inform the estimate
- the application of candidates in their study of the course and assessment
- an understanding of the national standard

Estimates are currently used in awarding meetings as an indication of cohort ability. The weight placed on estimates will vary from subject to subject but, to date, they have not been a significant aspect of business-as-usual decision-making.

Accuracy of centre estimates

Centre estimates are not always accurate when compared to the grades candidates achieve in practice. Estimating accuracy varies across centres, subjects and levels. Whilst the

majority of candidates achieve within one band of their estimate, around one-third are outwith this and only 45% achieve their estimated grade. As a result, some form of further moderation of centre estimates would likely be required in 2020 to address expected under and over-estimation.

Refined band scale

In our business-as-usual approach, a nine-point band scale is used by centres for their estimates and for purposes of SQA certification. As outlined above, a refined 19-point band scale was introduced for the ACM in order to more closely reflect mark distributions. Each of the business-as-usual bands has been split into two, except for lower A and D, which have been split into three to give more granularity at the decision points for national awarding purposes; and No Award (band 9), which has not been subdivided . This is mapped to the nine-point band scale and is outlined in Table 6. Centres were provided with advice and guidance to assist them in generating estimates using this refined band scale.

Table 6: Refined band scale

Grade	Band (BAU)	Refined band		Notional % range
A	1	1 upper	1	93–100
A	1	1 lower	2	85–92
A	2	2 upper	3	80–84
A	2	2 middle	4	75–79
A	2	2 lower	5	70–74
B	3	3 upper	6	67–69
B	3	3 lower	7	65–66
B	4	4 upper	8	62–64
B	4	4 lower	9	60–61
C	5	5 upper	10	57–59
C	5	5 lower	11	55–56
C	6	6 upper	12	52–54
C	6	6 lower	13	50–51
D	7	7 upper	14	47–49
D	7	7 middle	15	44–46
D	7	7 lower	16	40–43
No Award	8	8 upper	17	35–39
No Award	8	8 lower	18	30–34
No Award	9	9	19	0–29

4.2 Previous studies

Studies from across the UK, for GCSE, AS level and A level, about the accuracy of teacher estimates in comparison to actual results achieved, show similar trends to SQA's data.[2]

The findings about individual variables are broadly similar: subject has a small but unsystematic effect; sex and age have small effects that are inconsistent across subjects;

2 British Educational Research Association, Volume 31, No 1 Feb 2005, Teacher Estimates of candidates' grades: Curriculum 2000 Advanced Level Qualifications, Debra Dhillon, AQA, UK

centre type has a small effect that may be attributable to correlation between centre type and attainment. There are likely some effects on estimation accuracy of ethnicity (that is more over-estimation for some ethnic minority groups) and disadvantage (that is more over-estimation for the more disadvantaged in general and less over-estimation for the higher attainers) but those effects have not been quantified.[3]

To help mitigate these effects on this year's estimates, SQA has incorporated a section on bias into its SQA Academy course on estimation for teachers and lecturers.

4.3 Rank ordering of candidates

To inform the awarding approach, centres were asked to provide a rank order for each of their candidates within each refined band.

Baird (1997) concluded, most of the evidence suggested that centres were good at rank ordering students.[4] SQA has not used candidate rank order in assessment decision-making for many years, but it was previously used to form part of an alternative evidence appeals process. Rank order is still based on professional teacher/lecturer judgement but removes the need for teachers/lecturers to make specific grading decisions. In this approach teachers and lecturers are being asked to rank candidates on their attainment relative to other candidates. However, there are challenges of comparable decision-making within and across centres and if used as the only source of data this could result in candidates of equivalent attainment in different centres gaining different grades. Centre rank orders must therefore be linked to an estimate in any approach. For example, a centre may have 100 candidates ranked 1 to 100 but the highest ranked candidate may be estimated at grade C, band 6 (current 1–9 scale) therefore this would have to be factored into how any historical distribution is laid over the centre rank order. The inclusion of 'ties' in a rank potentially hinders the efficacy of rank orders. We advised centres to use ties sparingly and only for large multi-class cohorts.

4.4 Prior attainment

4.4.1 SQA data on prior attainment

SQA only holds meaningful prior attainment data at Higher and Advanced Higher. Prior attainment data is not available at National 5 or for all candidates in Higher and Advanced Higher due to a variety of curriculum approaches. However, it is a useful predictor of performance where present. It is currently used as an indication of cohort ability in awarding meetings. The extent of prior attainment (at the subject/level immediately below) in Diets 2017–19 is summarised in Tables 7 and 8.

3 Ming WEI Lee, Merlin Walter, 2020 Ofqual Research And Analysis: Equality Impact Assessment Literature Review

4 Baird J A (1997) Teachers Estimates of A level Performance, Guilford, Internal Report RAC/763, Associated Examining Board

Table 7: National 5 prior attainment in Higher courses

Year	Level	Percentage of candidates	
		No prior	Prior
2017	H	23.27	76.73
2018	H	22.74	77.26
2019	H	21.94	78.06

Table 8: Higher prior attainment in Advanced Higher courses

Year	Level	Percentage of candidates	
		No prior	Prior
2017	AH	2.18	97.82
2018	AH	2.07	97.93
2019	AH	2.11	97.89

There are variations in prior attainment by subject area. Prior attainment volumes are higher for higher-uptake subjects. In some National Courses at Higher, it can be as low as 5%, for example, Classical Studies. However, prior attainment — where available — provides a general indication of cohort ability within a National Course at a national level and an additional measure in any centre moderation activity.

4.4.2 Non-SQA data on prior attainment

The approaches to awarding that are likely to be used in other parts of the UK in the summer of 2020 are heavily based and dependent on data on the prior attainment of candidates who would have sat examinations this year. A major source of this data are the Key Stage 2 National Curriculum tests which have, as one of their main purposes, to produce a measure of cohort ability that can be used to inform setting of grade boundaries for general qualifications.

Whilst SQA has prior attainment data for candidates at Higher and Advanced Higher who have previously sat qualifications at lower levels, we do not have a source of prior attainment data that could be used to inform awarding decisions at National 5.

The closest comparable assessment information is the Scottish National Standardised Assessments (SNSA), introduced in 2017. These assessments, in Literacy and Numeracy, are completed by learners in P1, P4, P7 and S3. Their primary purpose is '…to help identify children's progress, providing diagnostic information to support teachers' professional

judgement'.[5] This purpose means that SNSA assessments are not delivered at a fixed point in the school year.

The primary purpose of SNSA and the way it is administered means that it does not provide a useable source of prior attainment data for SQA as part of its alternative certification model for 2020. Teacher professional judgement (ACEL) will be used to inform the journey of learners from broad general education into the senior phase and will take into account a wide range of other evidence including SNSA.

5 https://standardisedassessment.gov.scot/

5 Consideration of technical options

SQA considered and evaluated several technical options for the awarding model. These are outlined below in the following order:

- directly awarding centre estimates
- multiple linear regression
- awarding — national moderation only
- centre-level moderation — using previous centre outcomes
- awarding — using centre-supplied rank order

5.1 Directly awarding centre estimates

5.1.1 Description

SQA would directly award the estimates submitted by centres so that all candidates would be resulted with their band 1–9 estimate. No moderation of the estimates to address any over- or under-estimation would be undertaken.

5.1.2 Technical work undertaken

SQA reviewed estimated and resulted grades from Diet 2019. For estimates with a completion status of 'C', (ie where the candidate for whom the estimate was submitted had completed the examination and any coursework) 48% of grades estimated at National 5 matched resulted grades; at Higher 44%; and at Advanced Higher 43%. Estimate accuracy varied by grade with greater grade accuracy seen at grade A compared to other grades. Any comparison of estimates with results needs to be undertaken at candidate rather than at course level. At course level this type of comparison may suggest a strong correlation whilst at candidate level this is rarely the case. The comparisons in this section are made at candidate level.

Nationally, if estimates had been awarded directly in Diet 2019, overall the national A–C rates would have been very similar to the national A–C rates resulted for National 5 and Higher, but the national grade A rates would have been much lower. This is because whilst grade A estimates were on the whole more accurate, generally lower numbers of grade As were estimated than resulted in Diet 2019.

However, we know that this averages out learners who achieved more than their estimate and others who achieved less than their estimate, so candidate estimates are not always reliable.

Table 9: Estimates and published results in 2019

National 5:	**A**	**A–B**	**A–C**	**A–D**	**NA**
Estimates	27.8%	51.8%	78.6%	90.8%	9.2%
Published results	35.1%	58.9%	78.2%	90.7%	9.3%
Higher:	**A**	**A–B**	**A–C**	**A–D**	**NA**
Estimates	23.8%	48.6%	77.0%	89.6%	10.4%
Published results	28.3%	52.3%	74.8%	89.9%	10.1%
Advanced Higher:	**A**	**A–B**	**A–C**	**A–D**	**NA**
Estimates	27.0%	56.1%	84.0%	92.7%	7.3%
Published results	31.8%	56.7%	79.4%	87.8%	12.2%

Note: Estimates percentages and published result percentages have been calculated on different groups of candidates, as some candidates do not have an estimate and result.

The use of teacher estimates with no moderation was not progressed as a way forward, as this would not address any potential over- and under-estimation. As a result, this would not maintain national standards across centres or be fair to candidates.

5.2 Multiple linear regression

5.2.1 Description

Multiple linear regression is a statistical technique that uses several explanatory variables to predict the outcome of another variable of interest. To explore its potential for awarding, a model was developed and tested using three variables: estimates, coursework marks and candidate prior attainment where this was available, to predict an overall course ‘mark’ for each candidate. These three variables are currently used in awarding meeting decision-making.

5.2.2 Technical work undertaken

The model used Diet 2019 data for five National 5 and Higher subjects: English, Mathematics, Chemistry, Physical Education and History. These were selected to cover a small number of different subject/assessment types. Preliminary statistical modelling indicated that, should all the data for the variables be available, they could not reliably predict candidate performance in the previous diet for subjects/levels with high entry numbers.

In all cases, at least 40% of predicted grades did not match actual grade outcomes in Diet 2019 which does not provide a robust basis for awarding. As coursework marks will not be

available in 2020 and, with prior attainment information varying from subject/level to subject/level, the use of a predictive modelling approach was not progressed further. This option would not maintain standards across centres and would not be fair to candidates.

A further limitation of multiple linear regression is that it cannot account for systematic over- or under-estimation and/or bias at a centre level.

5.3 Awarding — national moderation only

5.3.1 Description

Under this approach for each National Course a national target grade and/or band distribution would be established based on agreed criteria. Centre estimates would be fitted to this distribution, with all estimates of the same category receiving the same result. For example, the Higher Mathematics distribution is set as grade A: 30%, grade B: 20%, etc. Starting with the first band, entire bands would be added to the 'A' category until the national subject/level distribution 'A' percentage set was achieved or exceeded. This would be an entirely automated process with no moderation at centre level.

5.3.2 Technical work undertaken

This option was assessed based on the original estimate scale (1–9), rather than on the refined band scale used for 2020, using Diet 2019 data and with target distributions set to actual result distributions awarded as per August 2019 certification. The process assumed a 'target' distribution (here, set to be the Diet 2019 observed attainment distribution) and allocated each band in turn starting from the best band (band 1) to the grade A result until the target grade A rate was exceeded. At this point, allocations of a number of bands had been made to result grade A. The next available band is then allocated to result grade B, and this process continues until the A–B cumulative 'target' distribution is exceeded. The next available band is then added to result grade C, and this process continues until the cumulative A–C 'target' distribution is exceeded. The allocations could be automated (coded), and in this case always exceeded the target distributions.

The outcomes of investigating this option indicated that the original estimate scale was not sufficiently granular to allow it to work effectively. This reflects the fact that SQA uses nine estimate bands, one of which (band 1) contains the perceived strongest learners estimated to be in the 85%+ category, and two bands (8,9) that indicate 'No Award' performance. This leaves only bands 2, 3, 4, 5, 6, 7 to allocate to result outcomes (A, B, C, D).

Due to every estimated band being treated in the same way and the cumulative distribution required to be the same or exceeded with the approach used, the result was national subject/level distributions that were far from the target distributions in some cases. Table 10 illustrates the end result of a national moderation approach applied to Diet 2019 data for selected courses.

Table 10: Change in Higher grade distribution

Subject			Percentage point change in grade distribution					
	Entries	Estimates	A	B	C	A–C	D	No Award
Chemistry	10,047	10,064	6.69	-1.26	5.84	11.27	-9.16	-2.11
English	35,461	35,408	5.85	1.39	-5.66	1.58	2.55	-4.12
History	9,987	9,989	8.13	0.52	-3.71	4.95	-1.01	-3.94
Mathematics	18,626	18,742	1.74	9.87	-4.07	7.54	-4.85	-2.69
Modern Studies	8,653	8,688	5.68	0.8	-3.38	3.08	-1.69	-1.39
Physical Education	9,896	9,931	2.86	0.59	3.79	7.24	-6.75	-0.49

The above demonstrates the use and limitations of the current estimate scale. Note that the grade A and A–C rates are always higher here due to using the rule ‘add more estimate bands until the cumulative distribution is exceeded’. It would also be possible, using absolute values, to choose the allocation that led to allocations that were closest to the target thresholds.

A further limitation of national moderation only is that it cannot account for systematic over- or under-estimation and/or bias at a centre level. This option was not progressed further, as it would not maintain standards across centres and would not be fair to candidates.

5.4 Centre-level moderation — using previous centre outcomes

5.4.1 Description

The first stage of this approach is the same as that for Awarding — National Moderation Only outlined above. For each National Course, a national target grade and/or band distribution would be set based on agreed criteria. Centre estimates would be fitted to this distribution, with all estimates of the same category receiving the same result. For example, the Higher Mathematics distribution is set as grade A: 30%, grade B: 20%, etc. Starting with the first band, entire bands are added to grade A until the national subject/level distribution grade A percentage set is achieved or exceeded. At the end of this phase, all estimates of the same value would have the same result.

A second phase would then attempt to address centre outcomes that appear very different based on historic centre-level performance measure(s). These measures could include year-on-year percentage point changes in resulted grade A rate and A–C rate, year-on-year differences in average Insight tariff scores.

5.4.2 Technical work undertaken

This model has also been evaluated using data from Diet 2019. Estimates on the current nine-band scale were fitted to the starting target distribution of the actual national level grade distribution for 2019 based on national awarding. At a centre/subject/level, the data that SQA holds historically allows the calculation of a number of summary values and measures, which provide an indication of the relative strength of qualification attainment in previous sessions.

Options for flagging results for moderation include:

- ranking centres by difference from a three-year historic average (eg difference in resulted grade A rate and A–C rate)
- ranking centres by difference in their average resulted Insight tariff score from a previous year/ three-year historic average
- flagging centres with resulted A–C and/or grade A rates that are outwith historic minimum or maximum ranges

If SQA determined measures to calculate in advance and how to prioritise these, centres could be flagged using these measures. The measures themselves would not indicate how to proceed or address any under- or over-estimation; decision rules would need to be developed for this purpose.

For some of the centres with large entries, it may have been possible to calculate a chi-squared statistic (or some goodness-of-fit measure) to assess whether the outcome distribution is significantly different from the three-year historic average distribution above for each centre. However, the level of entries and expected frequencies of each result category required for this approach would be very limited based on the prevalence of low-uptake course/centres combinations that characterises SQA's National Courses. Even in the uncommon cases where sufficient data was available, lack of fit does not then give any information on appropriate and acceptable ways to adjust the estimates.

In addition to the large number of low-uptake courses across many centres, the large number of centre/course combinations and the absence of historic data for some centre/course combinations are challenges for the implementation of this approach. This option was not progressed further in this form.

5.5 Awarding — using centre-supplied rank order

5.5.1 Description

Using this approach for each National Course in each centre a distribution is applied. Candidates are allocated to grades from rank 1 to the final ranked candidate.

5.5.2 Technical work undertaken

2020 is the first time for a number of years that rank order information has been collected. As a result, we did not have real centre rank order data to work on in advance of its receipt. Findings from modelling indicated that rank orders may be useful in allowing lower level of refinement in the allocation of results to learners, but doing this in a systematic way that is able to reflect genuine changes to cohort strengths within a centre leads to the same

problem that it depends on knowledge of what the expected centre outcomes for that qualification should be, ie this shares all the same challenges of the centre-level moderation approaches.

Essentially, if a centre-level expected distribution of attainment could be reliably arrived at, rank order would be potentially useful in the allocation to that distribution. However, as outlined in previous sections, low-uptake qualifications and/or centres complicates this approach. Nevertheless, rank orders may be useful in centre moderation approaches.

Using rank orders would allow for more granular decision-making, could facilitate differential adjustments across the grade distribution at centre level and would preserve centre rank orders. However, rank orders cannot be compared across centres because they are a judgement made by a teacher/lecturer about the relative performance of candidates in their centre. Consequently, this option was not progressed further in this form.

5.6 Conclusion

The technical models considered do not offer a simple solution for SQA. In principle, national moderation is attractive as it will ensure some consistency with results from previous years, thus helping to maintain national standards over time. However, this cannot be done without first carrying out centre-level moderation to ensure consistency of standards across centres, credibility of qualifications, and fairness to all candidates across Scotland. The initial modelling work used a range of different approaches, none of which on their own could be utilised for awarding 2020. However, what we learned from our analysis of these options assisted SQA in developing and trialling a suitable approach to awarding for 2020 that made best use of SQA's historical attainment data and the estimates and rank orders supplied by centres this year.

6 SQA's approach to moderating estimates for Awarding 2020

As outlined in section 5, the starting input into the awarding process was the estimates received from centres and their associated rank orders. However, as already outlined, published research and SQA's own historic analyses show that estimates are not always accurate. Accordingly, in the context of the ACM, a process for moderating the estimates was necessary.

This section details the approach to moderation applied in the awarding step of the ACM, and covers the following:

- It provides context for the 2020 moderation process by comparing the estimates received from centres to historical attainment.
- It sets out the awarding moderation methodology, which incorporates both centre-level moderation and a national-level plausibility check of moderation outcomes per course.

6.1 Support to centres in the estimation process

To support each centre in determining fair and accurate estimates and rankings in 2020, SQA provided centres with the following:

- Historical data on the centre's previous three years' estimates and attainment, so that at a departmental level, teachers and lecturers could understand if they had been accurate, lenient or severe in the past by comparing estimates with achieved results, and at centre level managers had information on which to base their review prior to sign off.
- An online course and published guidance: Information for Centres — Producing Estimates Session 2019–20, on best-practice estimating processes. The course included links to further resources such as course documents and SQA Understanding Standards material that illustrated grade-related standards. In this information provided, we asked centres to quality assure their estimates at both departmental and whole-centre level.

The SQA Academy online course also included a section on implicit bias and made explicit reference to a range of characteristics including sex and socio-economic status. In that section, centres are advised that candidate evidence should be valued for its own worth and merit as an indicator of course attainment, and that a conscious effort should be made to consider and avoid the negative impact of potential implicit bias.

In using these estimates as the basis for awarding SQA, needed to take account of the possibility that centres' estimation behaviour may be changed this year as a result of the additional data on the reliability of their previous estimates and the guidance on estimating provided by SQA this year.

Equality and fairness considerations — Estimates and rank orders

SQA was very clear from the start of the estimating process that estimates should be generated by centres with due regard for equalities. This was to reduce the likelihood of bias in estimates at the earliest stage of the process, prior to any moderation process by SQA.

As noted above, to support centres in this respect, SQA provided clear guidance on the need to avoid bias in the estimating process, supported by training materials made available via SQA Academy.

The estimating stage was the only stage prior to certification day where deliberate and explicit consideration of individual candidates occurred. All processes and stages described hereafter in this report refer to the application of standardised principles and rules to pseudonymised data at refined band and centre level. This is an important aspect of ensuring fairness for all centres and candidates.

6.2 Overview of 2020 entries and centre presentation

Estimates were received for 21,382 distinct centre/course combinations entered for National Courses (National 5, Higher and Advanced Higher). 15,370 (72%) of these distinct centre/course combinations presented 25 or fewer candidates. Table 11 breaks this down by level.

Table 11: Centre/course combinations (2020) by level

	Overall	25 or fewer candidates
National 5	9,251	5,520 (60%)
Higher	8,364	6,146 (73%)
Advanced Higher	3,767	3,704 (98%)
Total	**21,382**	**15,370 (72%)**

6.3 Comparison of 2020 estimates to historical attainment

After receiving the centre estimates on 29 May 2020, SQA undertook analyses to assess their alignment with known historical national attainment for years 2016 to 2019.

As attainment by grade at a National Qualification level has tended to be relatively stable over the past four years, the analyses sought to assess whether the 2020 estimates matched, in broad terms. those stable trends.

The tables on the next page compare the distribution of estimated grades and A–C rate, to attained grade distribution and A–C rate for each of the years 2016 to 2019. For additional contextualisation, the percentage point change relative to 2019 is also provided.

Table 12: Comparison of 2020 estimates to historical attainment for *National 5*

	National 5					
	A	**B**	**C**	**A to C**	**D**	**No Award**
2016 Attainment results	36.5%	23.7%	19.2%	79.4%	6.7%	14.0%
2017 Attainment results	37.1%	23.8%	18.6%	79.5%	6.5%	14.0%
2018 Attainment results	35.1%	23.1%	19.3%	77.4%	12.4%	10.2%
2019 Attainment results	35.1%	23.8%	19.2%	78.2%	12.5%	9.3%
2020 Estimates	**41.6%**	**24.6%**	**22.4%**	**88.6%**	**7.3%**	**4.1%**
Change from 2019	+6.5	+0.8	+3.1	+10.4	-5.2	-5.2

Table 13: Comparison of 2020 estimates to historical attainment for *Higher*

	Higher					
	A	**B**	**C**	**A to C**	**D**	**No Award**
2016 Attainment results	29.2%	25.2%	22.8%	77.2%	8.5%	14.3%
2017 Attainment results	28.7%	25.5%	22.8%	77.0%	8.4%	14.5%
2018 Attainment results	28.4%	25.3%	23.0%	76.8%	8.8%	14.4%
2019 Attainment results	28.3%	24.1%	22.4%	74.8%	15.2%	10.1%
2020 Estimates	**39.3%**	**26.9%**	**22.6%**	**88.8%**	**7.2%**	**4.1%**
Change from 2019	+11.0	+2.9	+0.1	+14.0	-8.0	-6.0

Table 14: Comparison of 2020 estimates to historical attainment for *Advanced Higher*

	Advanced Higher					
	A	**B**	**C**	**A to C**	**D**	**No Award**
2016 Attainment results	33.5%	25.8%	22.4%	81.7%	7.5%	10.8%
2017 Attainment results	31.7%	25.5%	22.8%	80.0%	8.1%	11.9%
2018 Attainment results	32.3%	25.9%	22.3%	80.5%	8.0%	11.5%
2019 Attainment results	31.8%	24.9%	22.7%	79.4%	8.4%	12.2%
2020 Estimates	**45.2%**	**28.4%**	**19.2%**	**92.8%**	**4.8%**	**2.4%**
Change from 2019	+13.4	+3.5	-3.5	+13.4	-3.5	-9.8

These tables show that estimated A to C attainment rates were 10.4 percentage points higher at National 5, 14.0 percentage points higher at Higher and 13.4 percentage points higher at Advanced Higher since 2019. The table also highlights that estimation at grade A contributed most to the significantly higher estimated A–C rate, particularly at Higher and Advanced Higher.

There may be several reasons why estimates were above historic attainment, which has been relatively stable over time. Some teachers and lecturers may have been optimistic, given the circumstances of this year, or may have believed, correctly or incorrectly, that this cohort of candidates may have achieved better grades due to a range of factors. It is not possible to draw definitive conclusions.

However, as the national awarding body, with responsibility for maintaining the integrity and credibility of our qualifications system, and ensuring that standards are maintained over time, the estimates highlight a clear case for moderation this year. Further, the difference between estimates and historic attainment was significant in most subjects. Overall, there was significant, but not uniform, variation between historic attainment and 2020 estimates across subjects, levels and centres.

6.4 Overview of the 2020 awarding approach to moderation

Details of the awarding moderation methodology are provided in subsequent sections of this report. This section prefaces the detailed description of the methodology by providing a brief and high-level summary of the moderation approach and setting out the basis on which it was adopted for awarding.

Fundamentally, moderation was undertaken at centre level, where a centre's 2020 estimated attainment level for each grade on a course was assessed against that centre's historical attainment for that grade on that course — with additional tolerances to allow for year-on-year variability in a centre's attainment.

In addition, at a national level, an assessment was undertaken for each course, to ensure that cumulatively across all centres, the national attainment level for each grade for that course matched historical attainment levels for that grade on that course — again with additional tolerances added to allow for variability in national attainment on a course.

Rationale for adopting this moderation approach

The key reasons for adopting this moderation approach are outlined below:

(i) **Fundamentally, a centre's estimates are assessed against that centre's own historic attainment with allowance for variability:** A centre's historic attainment on a grade per course provides a justifiable basis for assessing that centre's 2020 estimates for the same grade on that course. This is more justifiable, for example, than assessing the centre's estimates against a nationally derived comparator.

(ii) **The approach allows for variability in attainment relative to historic attainment through an expanded tolerance range for attainment at each grade:** It does not restrict a centre's 2020 attainment to its minimum and maximum historic attainment. The tolerable attainment ranges used in the moderation process are deliberately wider, to allow for variability on historic attainment.

(iii) **The assessment is undertaken at each grade for each course, which provides a level of granularity:** Theoretically, a centre's estimates could have been assessed on a whole-centre basis, eg total estimated attainment for each grade at the centre compared to historical total attainment for the same grade. However, such an approach would have ignored the potential for variable attainment by course at a centre.

The adopted approach assesses estimates from a centre by both course and grade, and thus considers and reflects historic centre attainment, with tolerances, by course and grade.

(iv) **Estimates are only adjusted where necessary and only by the minimum amount needed to bring attainment within the tolerable ranges for that grade:** Where a centre's estimated 2020 attainment for a grade on a course differs materially, ie outwith the tolerable ranges including the allowances for variability on historic attainment, the estimates will be adjusted. Notably however, the adjustment process will seek to move the minimum number of entries necessary to bring the grades within the allowable tolerance. It will not for example, seek to meet a pre-defined mid-point or minimum-point. This reflects, amongst other things, our approach of trusting teacher estimates and only adjusting where necessary.

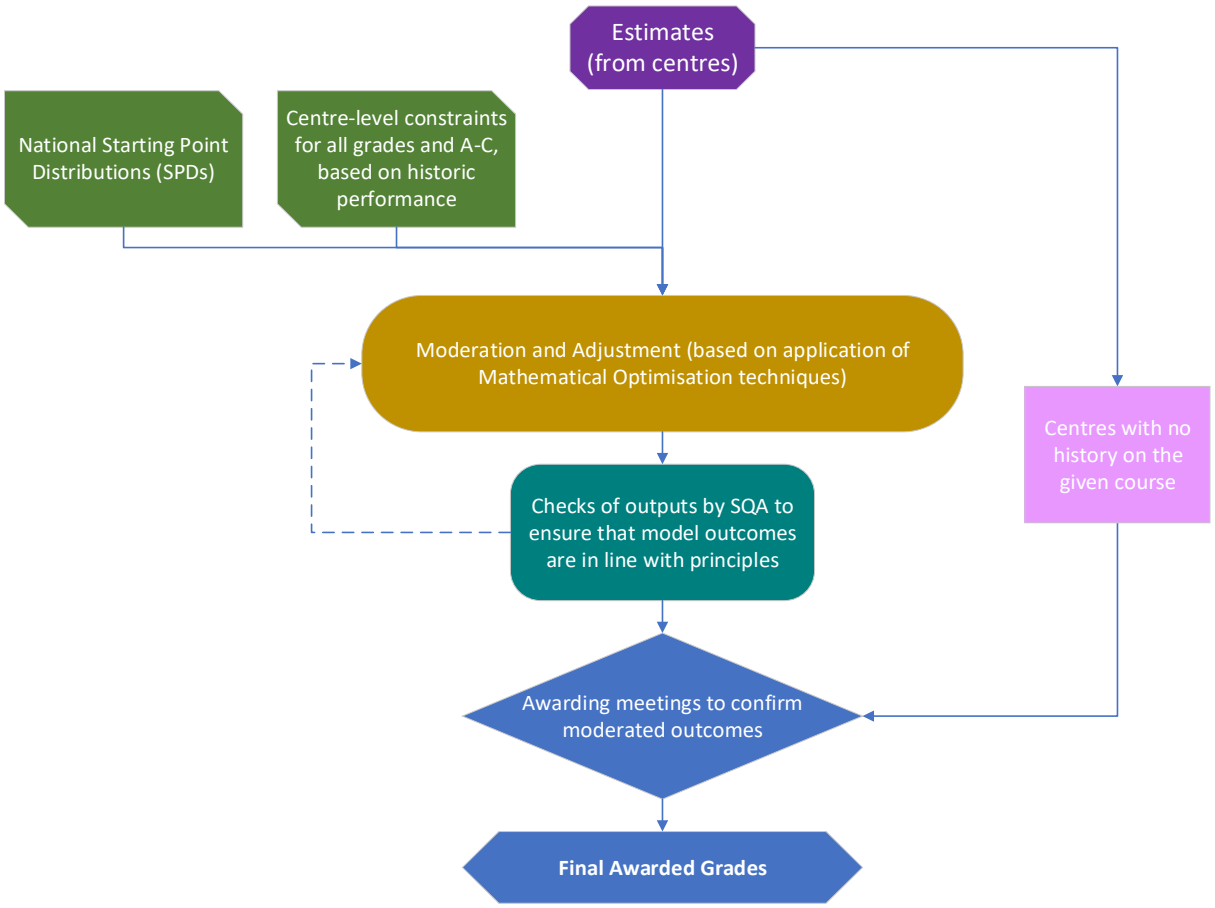
(v) **The inclusion of a process to ensure that national standards for the course are maintained:** In addition to centre moderation to ensure consistency with that centre's historic attainment, this approach also ensures that the cumulative moderated outcomes across centres for a course are within pre-defined national tolerances. This was achieved through use of starting point distributions (SPDs), which are described in detail in section 6.6 below.

The main purpose of the SPDs was to ensure that the cumulative result of centre moderation was broadly consistent with historic attainment by grade for each course, nationally.

6.5 Detailed summary of the 2020 awarding moderation methodology

The process map below graphically summarises the awarding moderation approach. Each step in the process is described in detail in the subsequent sub-sections.

Figure 1: Summary of the moderation approach



6.6 Definition of a national SPD for each course

To ensure that SQA's guiding principles were met, particularly *Principle 3: Maintaining the integrity and credibility of our qualifications system, ensuring that standards are maintained over time, in the interests of learners*, it was necessary to create a frame of reference against which both the estimates and the outcomes of the moderation process could be assessed.

Although the moderation was undertaken at centre level, a reference was also needed for each National Course, to ensure that the cumulative outcome of the centre moderation process by grade was broadly consistent with national historic attainment for that grade on that course.

Nationally, this frame of reference was provided by an SPD for each course. In simple terms, an SPD provides a projection of what a reasonable attainment distribution by grade for each course should be for 2020 based on quantitative and qualitative analyses of historic attainment and trends for the course and, where it was available, candidate prior attainment.

SPDs were first derived through a quantitative process that sought to take the average of as many recent comparable years of attainment data as was available for the course. In particular, the derivation was based — where possible, on historic attainment data that captured the introduction of revised National Qualifications (RNQ) changes that widened the D grade from a notional 45–49% to a notional 40–49%.

Table 15 below summarises the approach taken for each level.

Table 15: Summary approach for deriving SPDs for each level

National 5	The SPDs for National 5 were derived by taking the mean of the proportional national attainment levels for each grade in years 2018 and 2019 for the given course.
Higher	The SPDs for Higher were based on the proportional national attainment level for each grade in 2019 with some adjustment (described below). As 2020 reflects only the second year of the D grade extension for Higher, it was recognised that centres and learners could still be adjusting to the D grade extension. To reflect this, we drew on the changes observed for National 5 in the second year of the D grade extension at that level for the same subject. Specifically, the percentage change seen between the first and second year of the D band extension for National 5, was assumed and applied to the 2019 attainment for Higher in order to project 2020 attainment.
Advanced Higher	2020 is the first year for which grade D has been extended for Advanced Higher courses. Whilst the SPDs for Advanced Higher were fundamentally based on 2019 attainment therefore, an adjustment was made to reflect the D grade extension in 2020. The adjustment was based on the application of the average change seen in attainment levels observed in the first year of the D grade extension at National 5 (2017–18) and the first year of it being implemented for Higher (2018–19).

This initial SPD was supplemented by a qualitative review by key SQA subject expert staff and appointees including Qualifications Development heads of service, qualifications managers and principal assessors. In some cases, this review resulted in adjustment to the initial quantitively-derived SPD based on insight provided or trends highlighted by these subject experts. In addition, for Higher and Advanced Higher courses where SQA held prior attainment data for candidates on the equivalent course at the lower level (National 5 and Higher respectively), distributions were generated using SQA's progression matrices for live entries. These distributions provided an additional sense check for Higher and Advanced Higher SPDs, and for the vast majority of courses were remarkably similar to the SPDs generated using historical data.

For example, course content and associated guidance might have been enhanced such that teachers and candidates better understood assessment requirements relative to previous

years. Accordingly, the subject experts might advise that a slightly different national distribution would be expected for 2020, relative to previous years.

To further illustrate what an SPD is, the charts below show SPDs for National 5 English and National 5 Gaelic (Learners). The former is a high uptake course with reasonably stable year-on-year attainment; whilst the latter is comparably low-uptake and has more variable year-on-year attainment. (For contextualisation, the historic attainment by grade over the past four years is also shown for each course.)

Figure 2: **2020 SPD for National 5 English — alongside historic attainment for years 2016 to 2019**

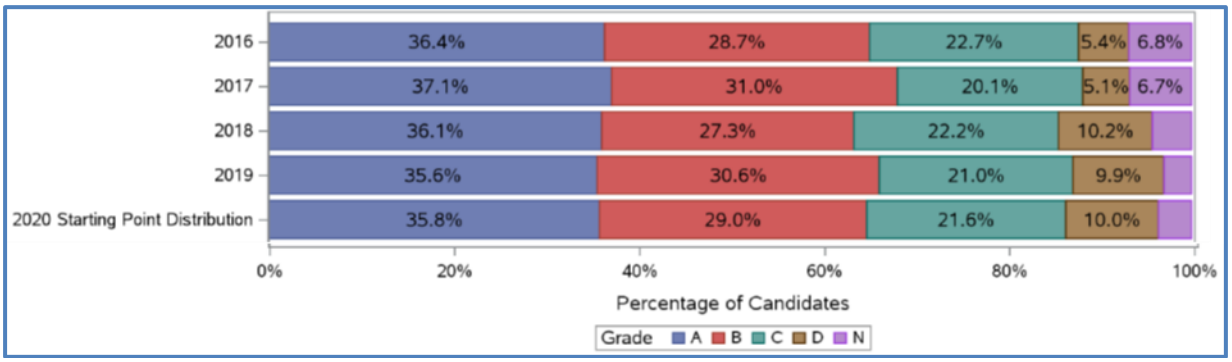
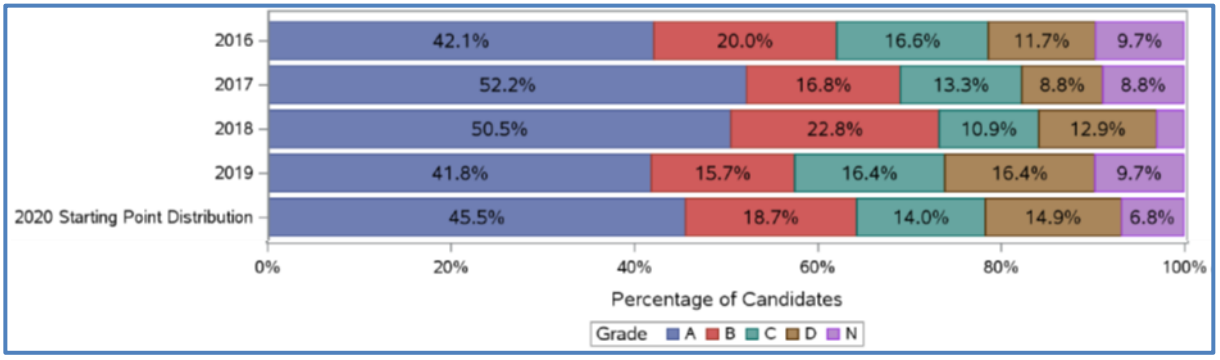


Figure 3: **2020 SPD for National 5 Gaelic (Learners) — alongside historic attainment for years 2016 to 2019**



As can be seen, the SPD for National 5 English mirrors the recent trends in attainment for this course for grades A, B and C. Furthermore, the impact of the D grade extension as projected for 2020 is visible in the SPD, relative to 2016 and 2017.

Whilst attainment for National 5 Gaelic (Learners) is more variable, it can also be observed that the SPD seeks to provide a representative view of what has been attained in previous years. However, the tolerance range around the SPD — discussed in section 6.7 below, is more meaningful for these low-uptake courses. Therefore, for each grade, the tolerance range, rather than the absolute proportional attainment shown in Figure 3 above, is what would have been used in the moderation process.

6.7 Defining tolerance ranges for the SPD at each grade for each course

As seen earlier with National 5 Gaelic (Learners), there can be year-on-year variability in national attainment levels for each grade. If moderation was undertaken using only the absolute SPD proportions for each grade, for example those SPD proportions shown in Figures 2 and 3 above, the possibility for year-on-year variation in attainment as typically seen for many courses historically, would have been precluded for 2020.

To allow for some variability in moderation outcomes at a national level therefore, tolerances are added to the SPD proportion for each grade for a course, to widen the range of allowable national outcomes around the SPD.

The tolerances are derived from the 90% confidence intervals for mean attainment levels for each grade over the four years 2016 to 2019, adjusted for RNQ changes where appropriate.

Taking the SPDs for National 5 English and National 5 Gaelic (Learners) shown above for example, the tolerable ranges of allowable outcomes per grade for each of these courses, are shown below. Note that a tolerance for total A–C rate was also used.

Figure 4: Tolerances for SPDs for National 5 English

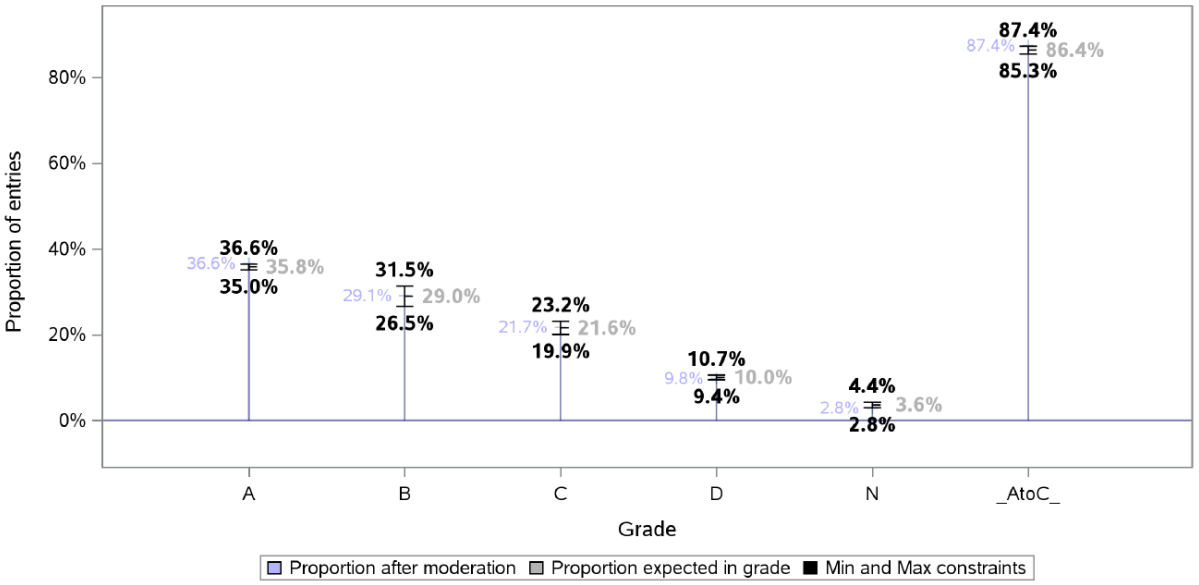
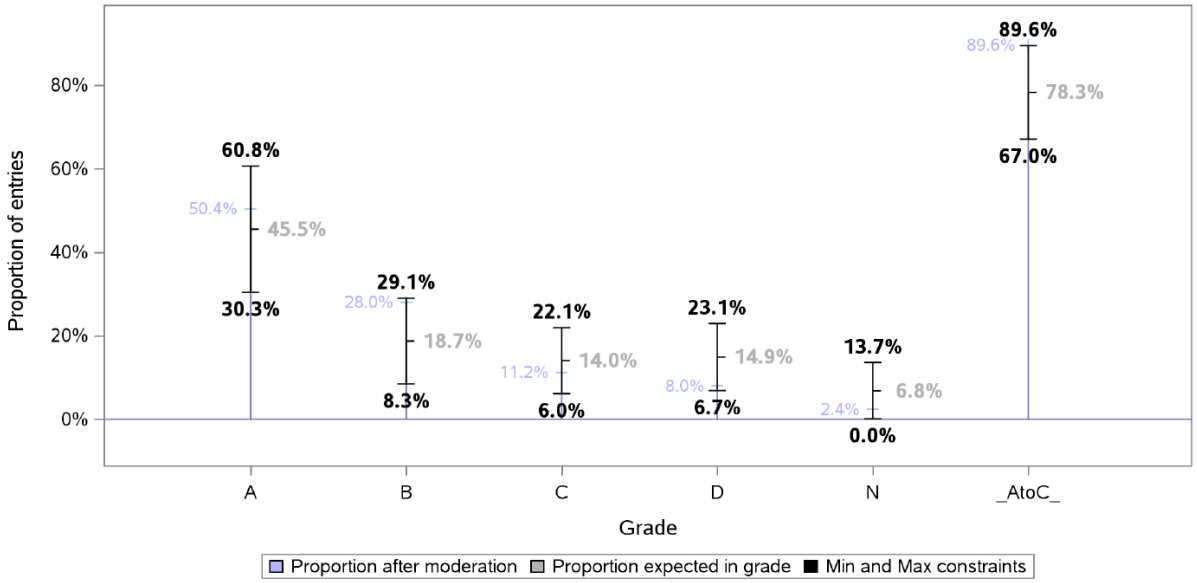


Figure 5: Tolerances for SPDs for National 5 Gaelic (Learners)



The method of deriving these tolerances captured the variability in historical attainment of the course over the past four years, 2016 to 2019. Accordingly, for courses where historical attainment has been stable, such as National 5 English, the tolerance ranges per grade were typically smaller. For courses where year-on-year attainment has historically been more volatile, such as National 5 Gaelic (Learners), the tolerance ranges per grade are wider.

In practice this meant that the higher the uptake of the course the smaller the tolerances were, as lower uptake courses tended to show greater year-on-year variability in results.

6.8 Definition of centre constraints

In the main, the moderation process was undertaken for each centre, for each course and by each grade and total A–C rate. Consequently therefore, a projection of 2020 attainment that would be expected, was required for each centre, by course and grade, against which estimates could be compared and moderation and/or adjustment undertaken.

To derive an expected projection of 2020 performance for a centre on a given course, both its historic attainment and historic attainment relative to other centres on that course over the past four years, were assessed — for each grade and overall A–C rate. This process is described below.

For each centre the proportion of entries achieving each grade on a given course, was assessed for each of the past four years, ie, 2016–19.

When this was assessed for all centres with entries for the course in 2020, it was possible to derive an ordered frequency distribution of attainment by centre on each grade across all centres for a given year. The frequency distribution orders centres into ranked groups based on the number of candidates attaining the grade. The centres with low attainment would be positioned along with similar performing centres at the lower end of the ordered distribution, whilst higher attaining centres would be positioned higher in the distribution.

An ordered frequency distribution as described above, can be split into bands to define rank position and groups to enable analyses. For example, it can be split into percentiles, which are one hundred 1% bands; ventiles, which are twenty 5% bands; or quartiles, which are four 25% bands.

The size of the ordered bands determines the granularity at which centres are grouped and ordered relative to each other. For example, a quartile approach would provide very wide rankings, whilst a percentile approach would provide a very granular ranking that would be inappropriate for SQA's low-uptake national courses.

For the purposes of assessing relative performance of centres on a grade, quartiles were deemed to be too wide and in particular, those centres on the edges of the quartile range could be treated unfairly. On the other hand, adopting percentiles would assume a very high level of precision in the relative ranking of centres and would also increase the number of groupings, thus adding complexity to the analyses.

Ventiles were viewed to provide a reasonable compromise. They provide enough sufficiently narrow bands for comparison and ranking, without being unmanageable or introducing an unwieldly level of complexity.

For each grade on each course in the most recent four years, it is possible to position a centre in a ventile band based on its attainment in that given year relative to other centres. The centre's ventile band position also allows it to be ranked relative to other centres.

To illustrate this, a hypothetical example is provided in the table below. Specifically, it shows the grade B attainment at a centre for a given course, and the ventile band in which it would accordingly be positioned in that given year.

Table 16: Hypothetical example to show how a centre's attainment on a grade relative to other centres also determines its ventile band position and ranking

Year	**2016**	**2017**	**2018**	**2019**
Grade B attainment as % of all entries at that centre	30%	29%	30%	32%
Ventile position in given year	v.10	v.9	v.10	v.13

This example shows that the minimum ventile band position for grade B attainment for this centre on that course over the past four years is ventile 9 in 2017 and the maximum rank position is ventile 13 in 2019.

In theory therefore, a proportional attainment reflective of historic ventiles 9 and 13 could form the minimum/maximum constraints for expected grade B attainment at this centre on this course in 2020.

However, it was recognised that there could be variability in a centre's 2020 performance relative to previous years. This is particularly pertinent for low-uptake course/centre

combinations, where small changes in the number of entries or the number of learners attaining a grade, could lead to a significant change in proportional attainment on that grade. To rigidly constrain centres to their historic attainment over the past four years would effectively preclude the potential for any variability in attainment.

6.9 Defining allowable tolerances for centre constraints to allow for variability

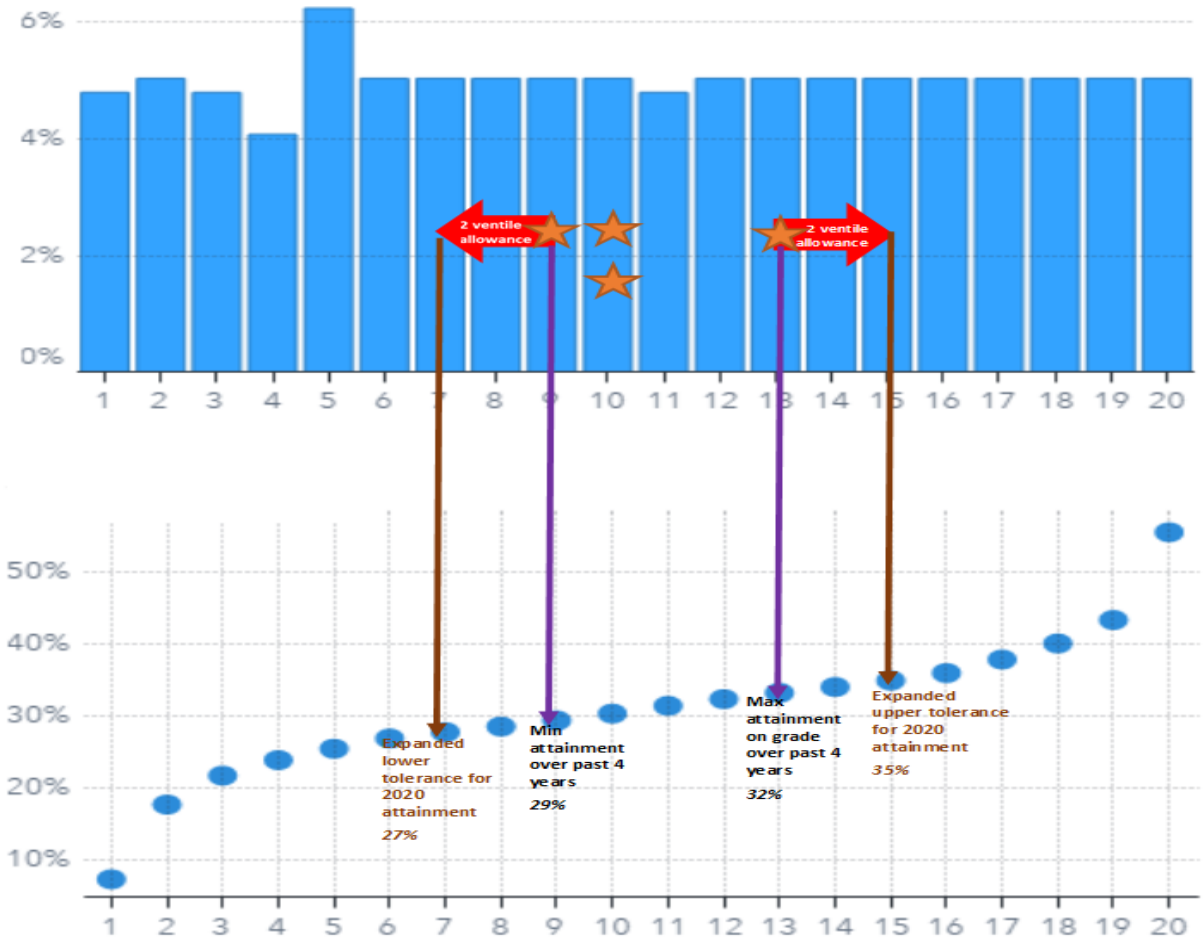
Centres' 2020 potential attainment on each grade for each course was not constrained to the proportional attainment reflective of their minimum and maximum ventile positions over the past four years.

To allow for variability, additional ventile allowances were provided to centres for each grade, relative to their historic minimum and maximum ventile positions for that grade on that course. In the final iteration of the model applied — and on which the August 2020 attainment results are based, an allowance of two additional ventiles in each direction was applied.

Returning to the example provided above, that hypothetical centre's estimated B grade attainment would be assessed against a proportional attainment range reflective of historic ventile 7 to ventile 15, as opposed to its historic minimum/maximum rank positions of ventile 9 to ventile 13.

This is illustrated graphically on the next page.

Figure 6: Centre moderation based on a wider tolerable ventile range than historic min/max to allow for variability in 2020 attainment



Once the final ventile range, including the additional two ventile allowance, had been determined for a centre for a grade on a course, the ventile range was converted to a percentage range. This was achieved by deriving a representative attainment percentage for each of the minimum and maximum ventile bands over the past four years.

These two percentages then became the lower and upper centre constraints, ie the range, for the expected attainment for that grade at that centre on that course in 2020. It was against this wider-than-historic range that a centre's estimated attainment on the specified grade was moderated.

6.10 Centres with limited or no history (on a course) over the past four years

Some centres did not have four years' history for a course for which they presented entries for 2020. For example, a centre may only have had one year's attainment data available, which clearly makes it impossible to derive a justifiable historic range for a grade on a course.

To overcome this, if any centre had only one or two years' attainment history on a course for which they had entries in 2020 (and in the case of those with two years' attainment data, where the historic ventile for a grade on that course is less than five ventile bands), then the historic range for that centre on that grade was extended in each direction, to provide a range of five ventile bands. For example, if a centre only had one year's history on a course and therefore had only a single ventile band position, then two ventile bands would be added to either side, to give a range of five ventile bands.

The additional allowance of two ventiles in each direction is then further applied to this extended ventile range, in order to allow for variability during the moderation process, as outlined in section 6.9 above.

Centres with no history, ie presenting entries for a course for the first time, presented a more significant challenge, as there was no historical or justifiable basis on which to set centre constraints for the grades or to moderate them. Accordingly, after exploration of a number of possible approaches to moderation, these centre/course combinations were excluded from the moderation process. (The rationale for this decision is outlined in more detail in section 6.19 of this report.) These centre/course combination candidates were therefore awarded the original estimates submitted by their centres.

6.11 Adjusting for RNQ D grade changes when setting centre constraints

The extension of the D grade as a result of RNQ was introduced earlier in this report, when the method for deriving SPDs was discussed.

This is also pertinent at centre level; especially when the determined ventile ranges are converted into percentage ranges.

When the ventile ranges are converted to percentage ranges, the historic data was used to calculate an expected percentage change for all grade proportions to reflect the RNQ changes. In summary, the mean proportion in a grade for the two years before the change are compared with the proportion seen in the year of the change.

For consistency, the basis of the calculation for National 5 and Higher were the same, as shown below.

For National 5:

$$\%\ \text{change in proportion} = \frac{\text{proportion of entries in grade in 2018}}{\text{mean}\ \left(\text{proportion of entries in grade in 2016 and 2017}\right)}$$

For Higher:

$$\%\ \text{change in proportion} = \frac{\text{proportion of entries in grade in 2019}}{\text{mean}\ \left(\text{proportion of entries in grade in 2017 and 2018}\right)}$$

For Advanced Higher, initially the mean of National 5 and Higher % change was applied. However, qualitative review indicated that this produced a larger change than anticipated.

Accordingly, to reflect the RNQ D grade changes in converting ventile band positions to actual proportions expected in each grade, half the mean of % change for the subject seen in National 5 and Higher was used for Advanced Higher.

6.12 Moderation and adjustment of estimated grades per course by centre

Having defined these constraints, the next stage in the process was moderation of the estimates from each centre for each course, and adjustment of estimates where necessary.

All estimates from all centres were, in principle, subject to moderation. This sought to assess whether the centre's estimated proportional attainment for each grade was broadly consistent with its historic attainment on that grade over the last four years — with additional allowances for variability. The tolerable ranges, ie, the centre constraints, against which the estimated attainment for each grade on a course were assessed, were derived as described in sections 6.6 to 6.9 above.

6.13 Adjustment of estimates (where necessary)

Where the assessment showed that a centre's 2020 estimated attainment on a grade was outside the tolerable range for that grade at the centre, the centre's estimates for that course were adjusted.

It should be noted that it was not possible to adjust estimated attainment for a single grade without impacting the estimated attainment for at least one other grade on that course.

Similarly, where an adjustment is made to bring the attainment for a grade within the constraints, there may have been knock-on effects. For example, if the estimated proportion for a grade was higher than the constraint ranges for that grade, then some entries estimated to receive that grade would have to be moved to another grade. The number of entries in that receiving grade would, therefore, increase and could consequently take that grade outside its constraints as well. This is sometimes referred to as a 'waterfall effect' and will result in further adjustments until the attainment for all grades are within the tolerable ranges set for each grade at that centre for the course.

Furthermore, it should be noted that whilst all estimates were moderated, estimates were only adjusted where necessary. Specifically, adjustment only occurred where a centre's estimated proportional attainment on a grade was outside of the defined tolerable ranges for that grade, based on the centre's relative historic attainment plus additional tolerances to allow for variability.

Where adjustment was required to a centre's estimates, all entries in an estimated refined band were moved between grades (as a group) to bring the centre's proportional attainment for a grade within the tolerable constraints defined for that centre for that grade.

Depending on the size of the adjustment required, entries in one or more refined bands could be moved. Critically however, where entries in refined bands were moved, the relativity of the refined band groupings, as estimated by the centre, were always maintained.

Ensuring that the relative ranking of learners as estimated by centres remained unchanged post-moderation and adjustment was of critical importance to SQA. The approach to maintaining relativity is discussed further in section 6.12 below.

The adjustment described in this section was undertaken using mathematical optimisation techniques. This is discussed in detail in section 6.13 below.

6.14 Maintaining the relativity of refined bands as estimated by centres

As discussed above, where adjustment of a centre's estimated attainment for a grade was necessary, this was achieved by moving entries (as a group) from one refined band into another refined band in another grade.

This section briefly discusses how this was undertaken, and critically, how the relativity between refined bands as estimated by centres was retained.

In summary, where it was necessary for entries in a refined band to be moved into another refined band in another grade, those entries previously in the recipient refined band were displaced, rather than the two groups of entries merging.

This is illustrated below with an example.

If a centre's estimated attainment for grade A is higher than the upper threshold of its allowable tolerance for grade A attainment, the adjustment process would identify the lowest ranked refined band in the A grade with entries, for example refined band 5, and move those entries out of that refined band to the highest refined band in grade B, ie refined band 6.

To maintain relativity, those entries originally estimated to be in refined band 6 would then be moved into refined band 7; and if there were any candidates estimated to be in refined band 7, they would be moved accordingly to refined band 8. This process of displacement continued down the subsequent refined bands, to as far as was necessary.

This approach is illustrated with an example below and is fundamental to our principle of treating the centres' rank orders as sacrosanct.

The first three columns of the table below show estimates received from a hypothetical centre for a given course. In this theoretical scenario, the centre has estimated entries in every refined band, each of which relates to a grade.

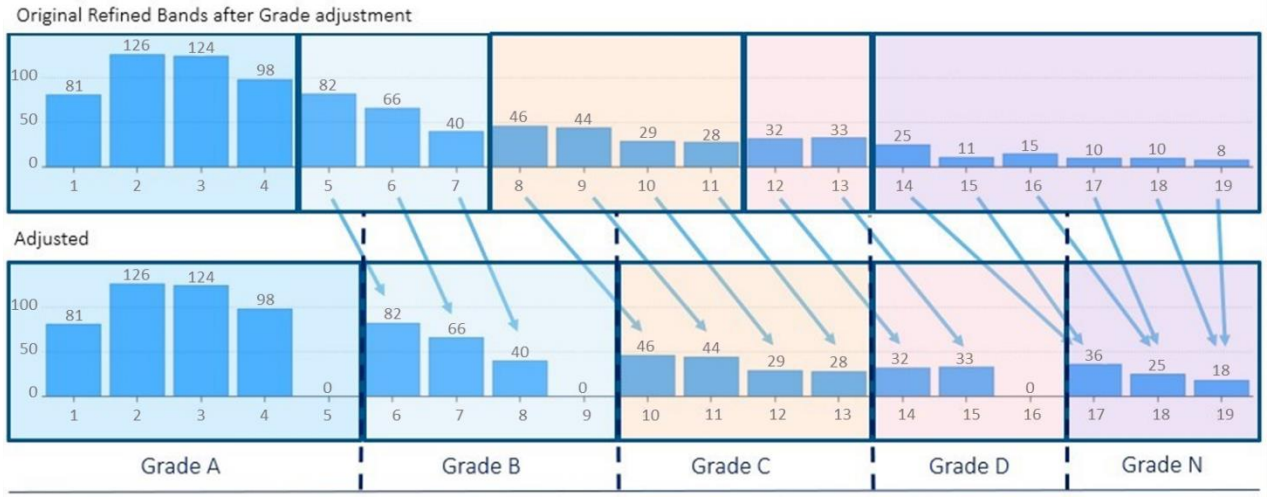
As a result of the moderation process, the centre's estimates have been adjusted and the fourth column of the table shows the grade that the entries in each estimated refined band have been adjusted to.

Table 17: Entries estimated by refined band and subsequent adjustment for a hypothetical centre and adjustment

Estimated grade	Estimated Refined Band	No. of Entries	Adjusted grade for entries
A	1	81	A
A	2	126	A
A	3	124	A
A	4	98	A
A	5	82	B
B	6	66	B
B	7	40	B
B	8	46	C
B	9	44	C
C	10	29	C
C	11	28	C
C	12	32	D
C	13	33	D
D	14	25	N
D	15	11	N
D	16	15	N
N	17	10	N
N	18	10	N
N	19	8	N

Figure 7 below shows how entries would be moved between refined bands to achieve the adjusted grade distribution in the hypothetical scenario above.

Figure 6: Movement of entries between refined bands to achieve the adjusted grade distribution



As can be seen, although entries have been moved between refined bands, the relativity of refined bands — as estimated, is maintained during adjustment, until the process exhausts the refined bands available for further displacement. At that point of exhaustion however, eg at refined band 19 — which is the lowest refined band in the No Award grade, there is no impact on the grade awarded as there are no further grades after No Award.

6.15 Mathematical optimisation — the technique applied for adjustment

As a consequence of our principle to adjust only the minimum number of estimates and only where necessary, and the challenges that arise both in identifying the refined bands from which entries could be moved and in managing the consequent 'waterfall effect', the adjustment process is complex.

To ensure that the adjustment process was undertaken efficiently, objectively, and in a way that automatically manages the inter-dependences in the process, an approach based on mathematical optimisation was used.

In simple terms, mathematical optimisation (more popularly called 'optimisation') is a family of techniques used to identify the best possible solution to meet a stated object according to one or more defined constraints.

Fundamentally, optimisation was selected as the preferred technique for adjusting estimates, because it tests all possible solutions concurrently, in order to identify the 'best available' value for an objective function — given a set of constraints, in a robust and efficient manner. Furthermore, optimisation techniques are tested and proven, both in industry and literature, and therefore provide a credible approach for undertaking the adjustments required to support this year's awarding.

The optimisation approach applied, was based on a mixed integer linear program within a network framework to ensure that the relativity of refined bands on a course as estimated by a centre, was always maintained.

Where adjustment was required, the primary objective function of the optimisation process was to minimise the number of candidates moved between grades to meet the centre constraints for each grade and A–C rate.

6.16 Minimising extreme grade movements

In defining the optimisation model, costs/penalties are included to disincentivise the model from doing certain things.

A key cost/penalty included in the model for adjustment of estimates was the number of candidates moved to achieve the centre-level constraints. In seeking to bring a centre's estimates in line with that centre's historic attainment, this cost/penalty sought to ensure that in doing so, only the smallest number of grades necessary were adjusted.

As something that is 'set' as part of the model, this cost could be varied by adding a weighting factor to it, which could for example, increase the costs where estimates are adjusted by multiple grades, eg by three or four grades.

As part of the model refinement process, the impact of alternative weighting factors for this penalty was assessed:

(a) In particular, adding an exponential weighting factor, ie exponentially increasing this cost as the number of grade changes from the original estimate increases, had the effect of increasing the volume of total adjustments required but minimised the number of extreme grade adjustments, ie adjustment of estimates by three or four grades.

(b) Conversely, a weighting factor that reflected a more direct relationship between the cost and the number of grades by which the estimates were adjusted by, resulted in fewer total adjustments, but more extreme grade adjustments, ie a larger number of estimates adjusted by three or four grades.

It was recognised that robust justification was required for all grade adjustments of three more grades to ensure that SQA was complying with its principle of only adjusting estimates where it had clear evidence that this was required. On this basis it was agreed that multiple grade adjustments should only be tolerable where necessary to achieve broad consistency with the SPD at both centre and national level. Accordingly, the cost function that increased exponentially based on the number of grades moved from the original estimates was adopted, ie, option (a) above.

It should be noted however, that the exponential weighting factor does not eliminate multiple grade movements, but only allows them in a small number of exceptional circumstances, for example where a centre's estimates for a grade deviate strongly from the tolerable attainment for that centre on that grade, as defined by its historical attainment plus allowances for variability.

6.17 Treatment of small centres/courses

From the early stages of developing the awarding process, it was recognised that low-uptake centre/course combinations[6] could present particular challenges.

This emanated from the fact that standard statistical tests, particularly where inferences are required to be drawn about a population, often require a reasonable number of values to be statistically reliant. For example, had we used Z-scores as the basis for the analyses, then the outcomes of such analyses for low-uptake centres could have been statistically unreliable.

The approach adopted in the moderation process for setting centre constraints, was not based on statistical tests for which sample sizes are critical, but instead premised on rank ordering centres into ventiles in line with their attainment on a grade over the past four years.

6 Whilst typically, these challenges are seen for small centres, the terminology of 'low-uptake centre/course combinations' is used, as indeed the challenge would also be seen for a large centre with a small cohort on a given course

This approach overcame the challenge of low-uptake centre/course combinations in that these will naturally have more volatile year-on-year performance, as one or two entries of differing attainment can cause large changes year-to-year for the centre/course.

In these cases, the centre's historic ventile range would be large — and made even larger by the additional two ventile tolerance. This therefore inherently allows for volatility in performance at these low-uptake centre/courses and would, in those cases, give them a wider tolerable attainment range for a grade, compared to, for example, large centres with more stable performance.

Consequently, it was deemed that there was no need to take additional measures for small centres or low-uptake course/centre combinations, eg aggregation at centre or local authority level, which was considered very early in the process.

6.18 Simultaneous optimisation to achieve the national SPD

As already discussed, the moderation approach sought not only to ensure that centre estimates were assessed against centre constraints (based on the centre's historical attainment plus additional allowance for variability), but also that cumulatively across all centres, national attainment by each grade and A–C rate on a course, were within the tolerances of the national SPD.

This was achieved by structuring the optimisation process to consider centre constraints and national constraints (ie, the SPD tolerances for that grade) simultaneously.

In order to meet the SPD tolerance for a course, it is sometimes necessary to adjust estimates from centres additional to the adjustment required to bring each estimated attainment for a grade, within the centre constraint boundaries.

To ensure that the selection of additional centres for adjustment to meet the SPD was undertaken as fairly as possible, a penalty cost function was applied for each centre, which determines its priority for selection. This is summarised in the bullets below.

The cost measure is based on the mean grade tariff scores for grades A to C:

- Grades A–C only are used so that complications due to RNQ D grade changes are avoided.
- The mean A–C tariff for the previous four historic years is divided by the 2020 estimated mean A–C tariff.
- If the 2020 value is higher than historic then the cost measure is less than one, if lower then the cost measure is greater than one.
- This optimisation objective function is multiplied by the cost measure for each centre.

6.19 Exclusion of centres with 'no history' from the moderation process

If a centre was presenting candidates and estimated grades for a course in 2020 for the first time, then as already explained, there would be no historic basis against which to set centre-level constraints. Given that centre-level constraints are key inputs into the centre moderation process, this presented a challenge.

We looked at several approaches for addressing this issue.

Initially, we sought to address it by setting constraints for all grades where a centre has no history on a course, to the full 20 ventile band range. In theory, this would accept estimates from that centre that aligned with any pattern seen for any other centres in the past four years.

Estimates from all centres for the course, including these 'new' centres, were then included in the optimisation process, which - as already described, assessed estimates against centre-level constraints and national SPDs simultaneously.

It was observed under this approach however, that for a minority of courses, estimates from new centres were being adjusted to meet the national level SPD tolerances for that course.

It was agreed that:

(i) This adjustment to estimates from new centres, in the minority of cases where it occurred, could not be justified based on evidence. (A key principle for the awarding model is that adjustment would only be taken where there was evidence to do so, so this risked violating that principle.)
(ii) As these adjustments were only applied to some new centres, depending on the course, it was recognised that there was potential for this to be unfair, given that other new centres on other courses were not being adjusted, and therefore being treated differently when their underlying circumstances were the same.

Consequently, we excluded new centres on a course from the optimisation process, as it was deemed that there was no evidence that could justify adjustments being made, given that no historic data was available.

In these circumstances therefore, the estimates from these new centres were accepted unchanged. These centres were excluded from the moderation process to ensure fairness to all other centres.

6.20 Possible use of centre dialogue as part of the moderation process

We considered very carefully whether to conduct a professional dialogue with schools and colleges as part of the moderation process. It was concluded that it would not be possible to include engagement with centres. The reasons for this are twofold:

- Firstly, the difficulty of operating a dialogue which is fair and consistent in its treatment of all centres and candidates. The basis on which we agreed or disagreed with a centre would need to be evidence-based and consistent.
- Secondly, the time that would be required in what was already a very tight schedule.

6.21 Equalities and fairness considerations

Use of optimisation allowed SQA to explore the impact on the outcomes of the moderation process of applying slightly different constraints. Assessing the outputs of each set of different constraints (an optimisation run) against a number of measures and our guiding

principles allowed us to make a judgement about which constraints generated the outcomes that best supported our principles for awarding.

As noted above, the tolerances set for attainment for each individual centre have been set in order to take account of year-to-year variation in attainment, that is where a centre has had a wide variation in results from year-to-year, that variation is reflected in the tolerances applied to that centre. This meant that we could allow for a degree of change in centre estimates in 2020 in comparison to previous years.

The tolerances set for national attainment for specific courses had been set in order to take account of year-to-year variation in attainment over time. This variation in attainment from year-to-year is reflected in the tolerances applied to the starting point distributions for that course.

As noted above, particular attention was paid to reviewing the outcomes of each optimisation run for low-uptake courses both nationally and for each centre to ensure they were not adversely affected. Our assumptions and constraints at the start of the awarding process had recognised that both areas would require attention and the use of tolerances for each centre and each course have enabled us to mitigate the potential impact of low-uptake courses.

7 National awarding meetings

As noted earlier in this report, each year SQA holds awarding meetings that bring together a range of staff and appointees with subject expertise and experience of standards setting across different subjects and qualification levels to consider how assessments have performed. During these awarding meetings grade boundaries are set following a consideration of a range of qualitative and quantitative information from the current year and the three previous years. Boundaries are set for upper A (band 1), lower A (band 2) and lower C (band 6). All other grades and boundaries are automatically calculated based on these boundaries.

The final stage of this year's awarding process was designed to replicate these meetings as far as was possible in the circumstances of this year. National awarding meetings were held with the key purpose of confirming the national distribution of grades achieved for each course, obtained as a result of the centre-level moderation of estimates described above. The meetings followed a format similar to that of the meetings held in a normal year and involved the subject specialist SQA staff and appointees who are central to decision-making in awarding meetings each year.

Each national awarding meeting was conducted using the same agenda:

1 Introduction

Purpose of meeting to confirm awards for subject and level, to determine the proportion of upper A (band 1) to be reported

2 Starting point distribution

Historical data, prior attainment (H and AH only)

3 National grade distributions

Initial estimates and post-moderation, number of candidates whose estimated grades have been adjusted

4 Centre moderation report (for noting)

5 Awarding decisions for the National Course

Confirmation of proportions by grade, upper A decision

6 Sign off

All meetings were held virtually. Each was chaired by a member of SQA's Executive Management Team and attended by the following:

- principal assessor (PA) for the course under discussion
- qualifications manager (QM) and qualifications officer (QO) for the course under discussion
- advisor (a head of service from SQA's Qualifications Development Directorate with knowledge and experience of the course under discussion)

As most of the data used to inform awarding meetings in a business-as-usual year is based on candidate performance in live assessments, the data available to inform this year's awarding meetings was more limited than normal. The specific data made available at each meeting is set out below.

Data available to each national awarding meeting, specific to the course under consideration:

- Historic results 2016–19 by grade and band
- Prior attainment distribution (Higher and Advanced Higher only)
- 2020 estimates by refined band
- The SPD including the tolerances for each grade
- National distribution by grade and band (two options provided for grade A bands 1 and 2) after centre moderation and optimisation
- Analysis of how estimates compare with the national distribution
- A centre moderation report that detailed the extent of adjustments to estimates

QMs, QOs, PAs and advisors had already seen much of this data at earlier stages of the ACM process. In preparation for the meeting, and consistent with the normal approach to awarding meetings, they were provided with access to the data 24 hours before each meeting. They were also provided with access to an online training course to help ensure they understood the nature of the awarding meetings this year and so could prepare effectively by reviewing and discussing the data in the context of the purpose and conduct of the meeting.

SPDs were created and the moderation process optimised for grades rather than bands, the moderation process did not allow us to easily differentiate between the grade A awards at band 1 and band 2. Whilst relatively few candidates in refined bands 1 and 2 would have been moved as part of the moderation process, to allow SQA to report on these bands it was agreed that PAs, QMs and QOs should make a recommendation at the meeting based on their analysis of the post-moderation refined band proportions. This recommendation was based on two possible options:

- All candidates in post-moderation refined band 1
- All candidates in post-moderation refined bands 1 and 2

Outcomes of the national awarding meetings

Possible outcomes of each national awarding meeting were:

- Agreement with the national distribution of grades based on the outcomes of the moderation process.
- Agreement to adjust the national distribution — this was expected only to be the outcome in exceptional cases.
- Defer the meeting for further consideration — where it was agreed that further information is required to inform the final decision by agreement with all parties the meeting could be deferred until the additional information is available.
- No agreement on final decision — where agreement could not be reached the decision will be referred to the Chief Examiner as is the case with grade boundary meetings.

- A decision on the proportion of grade A, band 1.

No issues were experienced in running the national awarding meetings: all national distributions resulting from the moderation process were endorsed by principal assessors, providing evidence that the outcomes of the moderation activity had achieved an outcome that they believed to be plausible. In a number of meetings there was discussion of the fact that final grade distributions were often near the top of or, in a small number of cases, exceeded the tolerances reflected in the starting point distributions. This arose when there were a number of new centres whose estimates were not included in the moderation process. Following this discussion PAs and QMs concluded that this was seen as a reasonable outcome based on the application of SQA's three principles for this year's awarding process to the estimates submitted by centres.

Equalities and fairness considerations

As with the data analysis, no centre or candidate-identifying information was provided to the national awarding meetings. This mitigated the risk of decisions being informed by conscious or unconscious bias.

As noted at points through this report, SQA has taken a number of steps throughout the processes involved in requesting, validating and moderating estimates to seek to take account of equalities and fairness considerations.

At an overall level, and in considering how SQA has sought to avoid bias in the results awarded for 2020, a key question is whether, despite the guidance provided, we were able to identify any apparent bias in the estimates submitted for 2020 and how we could determine whether this is evidence of actual bias or a reflection of centres' genuine and objective estimates of candidate performance.

To support this objective SQA is exploring internally and with Scottish Government what further analysis of historical and 2020 data it can undertake to help us understand any equalities implications of the 2020 process.

8 Outcomes of the moderation process

The full dataset showing the final outcomes of the moderation process are available on SQA's statistics page. Some key highlights are provided below.

Moderation outcomes

Of the 21,382 course combinations across National 5, Higher and Advanced Higher, 14,050 (65.7 %) were adjusted in some way. Of 511,070 entries, 133,762 (26.2%) were adjusted. Given the profile of estimates, most of the adjustments —124,565 or 93.1% — were down and 9,198 entries or 6.9% were moderated up. Of 133,762 moderated grades, 128,508 or 96.1% were moderated by one grade. 45,454 of entries (8.9%) were moderated down from grades A–C to a grade D or to No Award. Please note that these figures will differ from August publication due to further withdrawals and statistical data cleaning.

9 Final remarks

As the Deputy First Minister said on 19 March, exams in Scotland have been held every spring since 1888. As an education system, we are therefore in a situation which is unprecedented and very challenging.

The cancellation of exams required us all to consider, review and adapt our processes, in a very short space of time. SQA considers contingency arrangements every year, including this year, but the scale and complexity of the changes required in spring 2020 were simply unprecedented.

We have had to take some difficult decisions, as circumstances have changed, but we have continued to engage with a wide range of stakeholders, including national bodies, such as the National Parent Forum of Scotland, Connect, Young Scot and the Scottish Youth Parliament, to both inform our thinking and to ensure that concerns are understood and responded to in the right way.

SQA staff work hand in hand with Scotland's teachers and lecturers on a daily basis throughout the year, as well as with school and college management, local authorities, and representative bodies and professional associations. While there have been questions and constructive comments, there has also been widespread acknowledgement of the challenges we face this year, the speed at which change has been delivered and support for the approach we are taking in the circumstances. Schools and colleges continue to work positively with us to deliver for learners.

We are very grateful for the continued support of all in Scottish education and for all their efforts this year.

Appendix 1: Assurance

SQA required an assurance approach for the alternative certification model to determine the entitlement of candidates to graded National Courses in 2020, in the absence of actual pupil performance data. The absence of such data requires judgements to be made about the reliability of the models considered and the residual risk inherent in the selected model. Acceptance to key stakeholders was also crucial.

In order to assist the organisation in deciding on the most appropriate course of action we have applied the 'three lines of defence' model to create an appropriate assurance framework. This model is used by the Scottish Government and widely across the public sector. SQA adopted the model as a means of assurance in 2019.

The three lines of defence have been applied to the alternative certification model and they are as follows:

First line — The application of extant policies and procedures wherever possible. The application of the SQA risk management framework and review by heads of service, directors and the Chief Examining Officer.

Second line — Oversight and approval by internal oversight governance groups, including relevant project boards and oversight by the Code of Practice Governing Group. Oversight and endorsement by the SQA Board, supported by the Qualifications Committee and Advisory Council.

Third line — Independent review using appropriate sources of technical assurance. Firstly, SQA used independent technical experts to provide assurance on our approach to moderation. Expertise in educational assessment and statistics was provided by AlphaPlus. Their independent experts provided assurance on SQA's approach to moderation at each step in the process. They were involved in the detailed steps of the process and provided advice at key points in the development and execution of the methodology. SAS, a leading statistical software provider, supported SQA in formulating a robust and deliverable approach for moderating estimates. Secondly, SQA used key members of its Qualifications Committee and Advisory Council to provide professional expertise at key steps in the process. SQA also sought the advice of the Scottish Government's Qualifications Contingency Group, which involves key system stakeholders, at key points in the process.

Appendix 2: Timeline

1 March 2020	First positive case of COVID-19 confirmed in Scotland.
3 March 2020	Our first public statement: https://www.sqa.org.uk/sqa/93361.html. We continue to monitor the situation in consultation with the Scottish Government and at present, there is no change to the exam timetable or deadlines for coursework and other assessments.
12 March 2020	Our second statement advised the system that SQA is working through a range of scenarios: https://www.sqa.org.uk/sqa/93499.html. At present — exams going ahead as planned and schools remain open.
17 March 2020	First meeting of Scottish Government National Qualifications Contingency Group.
18 March 2020	Joint statement from Scot Gov / SQA issued: https://www.sqa.org.uk/sqa/93577.html. At present — exams going ahead as planned and schools remain open.
19 March 2020	Cabinet Secretary announces the closure of schools in Scotland and the cancellation of Diet 2020 examinations and asks SQA to develop an alternative certification model — including the completion of coursework.
22 March 2020	SQA announces that, according to latest public health guidance, coursework should not be completed in schools: https://www.sqa.org.uk/sqa/93637.html.
24 March 2020	SQA announces that, due to public health guidance, coursework for Higher and Advanced Higher, and some National 5 not yet uplifted, will not be considered or submitted for marking: https://www.sqa.org.uk/sqa/93658.html.
2 April 2020	Statement announcing estimate model and that no National 5 coursework will be considered: https://www.sqa.org.uk/sqa/93777.html.
20 April 2020	SQA issues detailed guidance to teachers on estimate model, also outlining a timeline for further guidance: https://www.sqa.org.uk/sqa/93920.html.
27 April 2020	SQA makes available an online course on its SQA Academy service to provide help and support to teachers and lecturers on the estimating process.
4 May 2020	SQA provides centres with their estimates and results for the previous three years.
29 May 2020	Centres submitted their estimates and rank orders for all candidate entries.
3 June 2020	Pseudonymisation of candidate and centre data.
3–5 June 2020	Initial review of estimates data.

6–29 June 2020	Moderation of estimates.
1–7 July 2020	National awarding meetings.
9–10 July 2020	Final quality checks and validation of data.
10 July 2020	De-pseudonymisation of data.