

NSCASE(23)12

The Quality Adjustment of Public Services

1. Proposal and recommendation

- 1.1. This proposal focuses on the measures of output of public services which are 'free at the point of delivery', such as social protection, schools, and health services. In the United Kingdom, around 20% of gross domestic product (GDP) is accounted for by the output of public services. Other G7 countries record similar magnitude (ranging from 19% to 24%), with the only exception being the United States, which is around 14%. Accurate measurement of these services is a common issue affecting all countries.
- 1.2. The UK has been working to improve its methods since the 1990s, leading to a seminal moment in 2005, when Sir Tony Atkinson delivered an independent review of the measurement of government output in the national accounts, which argued for a coherent framework of quality adjustments being applied to strong measures of public service output as the optimal method. This publication, alongside earlier UK work, and European developments, informed the development of the System of National Accounts 2008 (SNA08) in how to conceptualise and then empirically measure the outputs of public services contained in GDP, in line with practice in the UK and selected European countries, which had taken this one in the early 2000s.
- 1.3. From the late-2000s, however, international guidance diverged. Whilst the SNA08 permits quality adjustment, based in part on the European experience, the subsequent European System of National Accounts 2010 (ESA10) moved to reject this approach due to the challenges of ensuring comparability.
- 1.4. This paper proposes the UK moves away from alignment with ESA10, re-introduces quality adjustment of public services and changes to align with the SNA08. This would result in quality adjustments being applied to CVM estimates of public service output, but current price estimates would remain unchanged. This paper will explain the conceptual issues and the importance of such adjustments. Agreement would imply significant development investment by ONS to operationalise this decision, which would likely not be implemented before 2026.

2. Conceptual Background¹

2.1. Debate on public service output

- 2.1.1. Current debates about measuring the impact of the digital economy, specifically free digital goods² which deliver welfare gains to consumers need to be seen in the context of a larger group of transactions which are also free, or nearly free, to consumers. These are mainly public services. In the UK, around 20% of Gross Domestic Product (GDP) is accounted for by the outputs of public services, which

places the UK in the middle of the G7 countries under current statistics, but recent comparisons during the Covid-19 pandemic reveal differences in the precise statistical treatment of free goods.

- 2.1.2. The founding fathers of national accounting wrestled with how public service outputs should be treated in the accounts and indeed some, like Kuznets, proposed excluding them entirely. Hicks changed his mind at least twice on this question. In the event, the consensus was to adopt a convention – the so-called ‘output equals inputs’ convention – whereby these non-market outputs were deemed to be equal to the observable value of the inputs used to produce them. The implication of ‘outputs equals inputs’ is that public service productivity is always constant, with its growth rate, by definition, zero.
- 2.1.3. There are important reasons for taking public service output and productivity seriously.
- 2.1.4. One is the sheer scale of the transactions involved. In the UK, non-market public service output accounts for around a fifth of GDP³; the sector is well over twice the size of manufacturing. So, omitting them from the National Accounts would be to ignore a major part of the value which the economy generates. Similarly, to do so would be to overlook a material contribution to the overall productivity of the economy. Nor does such productivity performance simply mirror that of the rest of the economy. From 2010 to 2019 UK public service productivity rose, whilst whole-economy measures suggest a weaker performance over and since the pandemic.
- 2.1.5. A second reason why public service productivity is important relates to fiscal policy. Finance ministries are continuously in the horns of a dilemma, though one whose acuteness varies over time. On the one hand, the political pressure for improved public services is strong. Citizens as users have rising expectations of what they receive from health services, from publicly provided education, by way of social care and so on – no less than they have had rising expectations of the economy overall. Where many public services are key to tackling inequality and improving life chances, as these issues are important in public debate and amenable to improved public services, understanding the output of the public sector helps users understand governments’ steps to tackle inequality. But citizens as taxpayers are also reluctant to pay the rising taxes that might finance the improving public services. The only way to square this circle is to improve the efficiency and effectiveness of how taxpayers’ funds are used so that through increased productivity, more output is produced by the same amount of taxpayers’ money. Accordingly monitoring public service productivity is of policy importance over and above the sector’s (sizeable) contribution to productivity performance overall.
- 2.1.6. Third, the performance and efficiency of public services influence the productivity of the rest of the economy. A well-performing legal system, for example, is a vital underpinning of a well-functioning commercial sector. An efficient and well-performing health service is a major contributor to a healthy and productive workforce, while the outputs of the publicly provided education system make a direct contribution to the nation’s human capital. Arguably, the same outputs also feed into social capital and again underpin a well-performing economy overall.

2.1.7. Given the importance of these issues for economic commentary and policymaking, the balance of opinion in the national accounting community increasingly moved towards thinking that the ‘outputs equals inputs’ convention was untenable. There was no reason to suppose that it gave an accurate view of how the outputs and productivity of this growing sector were behaving within the overall economy. Since, by definition, it implied necessarily unchanging productivity within the sector, it could give no useful information regarding the other two issues: how well public services were making use of taxpayers’ funds or how productively the public services condition the performance of the rest of the economy. These drawbacks from ‘outputs equal inputs’ were substantial.

2.1.8. Accordingly, the 1993 System of National Accounts (SNA) recommended that, in future, countries should move away from the previous convention and instead adopt methodologies which measured the output of public services directly, using observable information relating to these services. This would mean of course that there was no reason why the estimated outputs from such methodologies would equate to the observed inputs. Accordingly, it would also be possible to estimate how productivity in these various sectors was changing over time.

2.1.9. ONS was one of the early movers, together with a handful of other National Statistics Institutions (NSIs), in taking forward this new agenda. Introduced around 1998, some two-thirds of public service outputs by value were measured directly¹. The remaining one-third or so continued to be measured by ‘outputs equals inputs’; primarily so-called collective services², in particular, defence and what is defined as “other” government services (which includes include a variety of smaller activities such as general government services, economic affairs, environmental protection, housing, and recreation). However, not long after the new methodologies were put in place, the estimated productivity series began to demonstrate paradoxical behaviour. Having been rising at fairly steady rates up to 1997, the estimated productivity of the directly measured sectors fell by over 20 per cent in the four or five years after 1997. It was hard to understand why the estimates were showing such declines. Nor was there any corroborating evidence to suggest that such declines had occurred. Accordingly, users’ confidence in the validity of the estimates became increasingly strained³. Since the output-driven estimates also now fed into the UK National Accounts overall, confidence in those, too, was also in question.

2.2. The Atkinson Review

2.2.1. In these circumstances, at the end of 2003, the then UK National Statistician, Len Cook, asked Sir Tony Atkinson to conduct an independent review of methodologies to measure public service output and productivity. His terms of

¹ Work the authors believe was led in the mid-1990s by David Caplan, a present NS-CASE member.

² Those services delivered inclusively to the whole of society without exclusion or rivalry, such as defence services, as opposed to personal services, which are delivered and measurable on an individual basis, such as education.

³ Noting some users, such as the MPC at the Bank of England frequently use market sector GVA as its preferred measure.

reference also included looking at the way ONS had approached the new SNA agenda and its implementation of direct measurement methodologies, including quality adjustment. The Atkinson Review lasted for just over a year and Sir Tony published a report in January 2005 setting out his conclusions.

2.2.2. The Atkinson Review was a milestone in this agenda. The report clarified many issues and proposed a model for measuring public service outputs. On the basis of its recommendations, it outlined a research and implementation programme in the various main public service areas. Len Cook accepted Atkinson's conclusions, subject to underlining that their full implementation would take time and be conditioned by the availability of resources.

2.2.3. Fundamentally, Atkinson agreed wholeheartedly that the SNA had been right to counsel direct measurement of non-market public services. The drawbacks of the traditional 'outputs equal inputs' convention was just too great to be acceptable. By the same token, ONS had been right to take up this agenda. The problems observed in the UK data were real ones but were rooted in the way the agenda had been implemented, as discussed further below, not because the overall agenda was problematic.

2.2.4. Atkinson's report strongly argued that the need was for a clear set of explicit principles to be applied to determine consistent high-quality methods. One particularly important principle related to what should, in theory, be included in a country's national accounts and therefore what the methodologies should be striving to capture. Atkinson contended that the key consideration in national accounts was value; thus, GDP could be considered as the cumulative value added from the economy, going through the various stages of production. It was therefore necessary to avoid measuring public service output solely by what were essential activities – say, the number of medical procedures performed, or the number of pupils taught, particularly where such measures may incentivise perverse outcomes; such as fire services being measured using the number of fires they put out, where increasing fire prevention activity would lead to a reduction in output, rather than growth.⁴

2.2.5. A second key principle was therefore that the estimates of public service output should be quality adjusted. At a common-sense level, the value of a healthcare intervention clearly depends upon its quality. The procedure is of value only to the extent that it leads to a health outcome superior to a counterfactual where the procedure had not been carried out. This leads inevitably to the question of how outcomes should relate to the estimates. Traditionally, national accountants had been reluctant to consider outcomes as relevant and with some good reason. In most countries, life expectancies and healthy life expectancies have risen significantly over time. While improving health services have played a part in this, the broad evidence is that this has been a minority contributor with factors such as improving diets, falling smoking and healthier environments being much more important. It would therefore be quite wrong to ascribe the whole value of improved health outcomes to the output of healthcare sectors. On the other hand, to the extent that an improved health outcome can be directly attributed to the activities of healthcare systems, then that should be taken into account in the estimated output whenever the data allows. Similar evidence from education

suggests education services drive around 30% of educational attainment after family and parental contributions and innate capabilities / skills are taken into account.

2.3. The SNA and ESA views on quality adjustment

2.3.1. The Atkinson Report was widely debated in the years following its publication. Its approach was largely accepted and helped shape the revised 2008 System of National Accounts (SNA). The principle of allowing for quality adjustment in estimates of output was accepted and emphasised, as part of a wider trend of economists becoming increasingly comfortable in addressing social welfare function issues.

2.3.2. Chapter 15 of the SNA08, paras 15.116-15.125 (replicated in Annex A) covers the issue of measurement of non-market output, with paragraphs 15.118 and 15.122 being particularly explicit on the point that such quality adjustments should be performed.

2.3.3. Indeed, it states that *'quantity indicators should be adjusted for quality change. For example, services should be sufficiently differentiated with the aim of arriving at categories that can be regarded as homogeneous. An aspect of quality change is then captured by changes in the proportions of different categories if the weights assigned to each category are frequently updated. In addition, the quantity indicator of each category can be augmented by an explicit quality adjustment factor. One way of identifying explicit quality adjustment factors is by reviewing the effects that the service has on measures of outcome'*.

2.3.4. The European System of Accounts (ESA) which generally follows the SNA, as its guiding principle, surprisingly, and somewhat regrettably, took the opposite view and despite having developed a framework for measuring quality adjustments in the Prices and Volumes Handbook in 2001, and resultant implementation work by several countries, retreated to removing quality adjustment from its ESA 2010 iteration due to challenges in ensuring comparability.

2.3.5. Chapter 10 of the ESA10, 10.28-10.30 (replicated in Annex B) explicitly precludes the inclusion of such quality adjustments within the core accounts, highlighting that:

2.3.6. *In the European Union, given the conceptual difficulties and the absence of consensus on output methods adjusted for quality (based on outcome), such methods are excluded from the central framework in order to preserve the comparability of the results.*

2.3.7. As described above, these are directly contradictory positions. Chapter 10 is, in addition, a clear exemption from the overarching principles outlined in both ESA10 and the Eurostat Prices and Volume Handbook (chapter 2.4.1) that *'observed price changes may reflect changes both in characteristics and pure price changes. A value has then to be estimated for the change in the characteristics, in order for the price index to reflect pure price changes only...*

The quality of a product is defined by its (physical and non-physical) characteristics. In principle, whenever a characteristic of a product changes, it is to be considered a different quality of the product. These changes in characteristics are to be recorded as changes in volume and not as changes in price (cf. ESA 2010, par. 10.18), noting that the Handbook (replicated in Annex C) s3.1.2 replicates the Chapter 10 exemption.⁴

2.3.8. This illustrates how contentious this topic remains. This decision was purportedly in the interests of international comparability, but as Foxtan et al (2019) persuasively argue there seems to have been some muddled thinking at work. Imposing process comparability through the universal application of recognisably weaker methods does not necessarily serve the interests of statistical comparability. With quality adjustment not allowed those countries where public services have improved in quality have output systematically underestimated. Conversely, those countries where quality improvement has been relatively weak or declined have output systematically over-estimated. As Foxtan et al set out, this can only prejudice rather than help international comparability.

2.3.9. Recent experiences around the measurement of non-market output, including joint OECD-ONS work (Lewis et al 2021) reveal the weaknesses around countries, not including comparable measurement of *either* output or outcomes. During Covid-19, the UK, which measures the majority of non-market output directly suffered a larger fall in GDP compared to countries that rely on the 'output equals inputs' convention and appeared to therefore perform *worse* despite using superior methods, exactly as hypothesised by Foxtan et al in 2019.

2.4. Current UK and International Practice

2.4.1. The National Accounts are currently produced in line with ESA10 for both current price and volume (CVM) estimates. The UK is required, in line with the EU withdrawal and related agreements, to supply ESA10 consistent estimates of GNI data in current prices for the setting of budgetary contributions for the period of the UK's membership of the EU. This requirement extends to 2024.

2.4.2. As quality adjustment is a purely CVM method (as we are looking to replicate the impact of the price deflator for priced goods to demonstrate the consistency of output in value terms through time), applying these adjustments before the end of the withdrawal agreement would not breach these agreements, which require only current price data to be submitted for budget setting purposes. However, due to the need for systems and conceptual work, it is likely that implementation would need to occur post-2026.

2.4.3. Nevertheless, it should be noted that whilst the UK recognises the importance of this agenda to accurate statistics, few other countries have made definitive

⁴ One should also note the Handbook is only mandated for *annual* price and volume measures. The current practice in many European countries retains 'inputs equals output' for *quarterly* GDP, further widening gaps within countries between data reported at different times and with those using output measures in the quarterly series, such as the UK.

steps in this area, and whilst we have received numerous visits on this topic in recent years, the drive amongst the major developed economies appears minimal, even outside the European Statistical System. However, as Covid-19 revealed, the UK's current output-based approach already acts as an outlier, it is debatable whether adding more sophisticated methods would worsen this position.

- 2.4.4. Equally, it cannot be supposed that quality adjustments will always be a *positive* addition to growth. Indeed, if one looks at the quality adjustment applied to Public Order and Safety in the Public Service Productivity metrics, this has been consistently negative since 2010, recognising weakening delivery across a basket of measures of prison security (escapes), prison safety (assaults, self-harm, and self-inflicted deaths) and re-offending, along with measures of court timeliness.
- 2.4.5. Further consideration would need to be given to the current UK treatment in the Public Service Productivity data around the weighting of quality adjustments. For example, the hospital procedures adjustment treats a 1% increase in quality adjusted life years following procedures as a 1% increase output, which arguably seems suitable, given the widespread use of quality adjusted life years as a key outcome of healthcare economic evaluations. In contrast, whilst the education quality adjustment treats a 1% quality increase over a basket of metrics as equivalent to a 1% increase in output, the main aspects of this basket are not based on independent measures of outcome, but performance metrics which are directly influenced by government policy. For example, the current education quality adjustment increases education output by 25% over the period 1997-2019, but this is a period during which there has been an active debate around grade inflation and equally active steps to attempt to reduce this phenomenon. As such, we might need in practical terms to consider the feasibility of metrics which are consistent over time (e.g., independent education outcomes such as numeracy, literacy, and employability) or to look to value education in terms of the increment to investment in human capital directly, rather than through qualification data. This is a challenge amongst others in terms of practical development ONS would take forward if this proposal is agreed upon.
- 2.4.6. Finally, if public service non-market output is agreed upon for revision, further thought would need to be given to the conceptual basis for the quality adjustment of free services delivered by other institutions, primarily the NPISH sector. This paper does not address this topic as further research is required on this topic, but it remains an open question and NS-CASE's views on whether it merits pursuit would be appreciated.

3. Proposal for Consideration

- 3.1. There is no requirement under the Withdrawal Agreement to produce volume data in accordance with ESA10. Where a quality adjustment is related only to volume, not current price series, **the proposal is to introduce existing quality adjustments already derived by ONS into the National Accounts.**

3.2. Due

to the significant development work, which ONS will lead on, to implement this, and the need to include changes into the annual Blue Book cycle, the absolute earliest this could be undertaken is 2024, although as this is proposed to be a 'data-only' Blue Book, that is one which does not make the methodological adjustment back through the time-series. With 2025, therefore, being the earliest a number of ARIES related transformation programmes can deliver their changes, the practical earliest date for implementation would be 2026.

3.3. This is after the period during which we are required to meet international agreements to produce against ESA10, rather than SNA08.

3.4. NS-CASE are asked to note the SNA 2025 process appears likely to recommend updating the methods used around 'sum-of-costs' methods in the measurement of the public sector, so ONS will need to ensure these are aligned if this proposal is accepted.

Current Quality Adjustments applied to public service productivity output at the ONS

3.5. Quality adjustments have been implemented *only* in public service productivity statistics following the recommendation (from 6.26 to 6.33) of the Atkinson review (2005). The report states that the output of the government sector should in principle be measured in a way that is adjusted for quality, taking into account the attributable incremental contribution of the service to the outcome. Current methods are outlined in Annex D and are applied back as far as feasible, which is no earlier than the mid-1990s.

3.6. UKCeMGA (UK Centre for the Measurement of Government Activity) was established to carry out this work. It followed up the Atkinson Review by including some quality measures in productivity articles on Education and Healthcare. A consultation was held in 2006 and 2007 to hear from experts and give further legitimacy to the development process. This ended with the publication of a strategy in 2007, Measuring Quality as Part of Public Service Output, which set out a conceptual framework for measuring the quality of public services.

3.7. Since February 2015, the annual estimates of public service productivity have been published in their current format. Since then, continuous development work has led to, among other improvements, three new quality adjustments for Public Order and Safety, Adult Social Care and Children's Social Care. The review and the expansion of quality adjustments is one of the development priorities of ONS, as highlighted in the Productivity development plan: 2021 to 2023.

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Annex

A: SNA 2008 – Chapter 15 – relevant sections (author's highlighting)

Non-market output of government and NPISHs

15.116 The current value of the output of non-market goods and services produced by government units or NPISHs is estimated on the basis of the sum of costs incurred in their production, as explained in chapter 6. This output consists of individual goods and services delivered to households and collective services provided to the community as a whole. The fact that such output is valued on the basis of the value of inputs needed to produce them does not mean that it cannot be distinguished from the inputs used to produce it. In particular, the change in the volume of output can be different from the change in the volume of inputs. Changes in productivity may occur in all fields of production, including the production of non-market services.

15.117 In practice, there are three possible methods of compiling volume estimates of the output of non-market goods and services. The first is to derive a pseudo-output price index such that when it is compared to the aggregate input price index the difference reflects the productivity growth thought to be occurring in the production process. Pseudo-output price indices can be derived in various ways, such as by adjusting the input price index according to the observed productivity growth of a related production process or by basing the growth of the pseudo-output price index on the observed output price indices of similar products. However, such data are rarely available for the goods and services produced by government and NPISHs.

15.118 The second approach, the “output volume method,” is recommended for individual services, in particular, health and education. It is based on the calculation of a volume indicator of output using adequately weighted measures of output of the various categories of non-market goods and services produced. **These measures of output should fully reflect changes in both quantity and quality.**

15.119 The third approach, called the “input method”, may be used for collective services such as defence for which the “output volume method” is hardly applicable because there are, in general, no adequate quality-adjusted quantity measures of output. The “input method” consists of measuring changes in output by changes in the weighted sum of volume measures of all the inputs. The latter should fully reflect both changes in quantity and quality. They are generally best derived by deflating the various input costs by corresponding constant-quality price indices, or when such price indices are unavailable, using volume indicators that reflect input volume change (for example, the number of hours worked by employees).

15.120 It is useful at this stage to define the terms input, activity, output, and outcome. Taking health services as an example, input is defined as the labour input of medical and nonmedical staff, the drugs, the electricity, and other inputs purchased, and the consumption of fixed capital of the equipment and buildings used. These resources are used in the activity of primary care and in hospital activities, such as a general practitioner making an examination, the carrying out of a heart operation and other activities designed to benefit the individual patient. The benefits to the patient constitute the output associated with these input activities. Finally, there is the health

outcome, which may depend on a number of factors apart from the output of health care, such as whether or not the person gives up smoking.

15.121 The measurement of the volume of output of non-market individual services should avoid two pitfalls. The first of these is that it should not be restricted to reflect the inputs or the activity of the unit producing the services. Inputs are not an appropriate measure and while activities may be the only available indicator and hence have to be used, they too are an intermediate variable. What should be measured is the service rendered to the customer. The second risk is that if outcome is defined in terms of the welfare objectives of the non-market service (for example, changes in the quality of health for the measurement of the health service, or changes in the quality of education for the measurement of the education service) the change in the volume of the output of the non-market unit cannot be reflected by the change in the indicators of outcome. This is because indicators of outcome can be affected by other aspects that are not directly related to the activity of the non-market services. For example, in the case of health, it is well known that there are many factors other than the output of the non-market health units, such as sanitation, housing, nutrition, education, consumption of tobacco, alcohol and drugs, pollution, whose collective impact on the health of the community may be far greater than that of the provision of health services. Similarly, the output of education services is quite different from the level of knowledge or skills possessed by members of the community. Education services consist principally of teaching provided by schools, colleges, universities to the pupils and students who consume such services. The level of knowledge or skills in the community depends in addition on other factors, such as the amount of study or effort made by consumers of education services and their attitudes and motivation.

15.122 In the light of these observations, the “output volume method” is the recommended method for compiling indicators of volume change of non-market services. The method is based on quantity indicators, adequately quality adjusted, weighted together using average cost weights. Two criteria should be respected to compile adequate indicators of volume change. In the first place, the quantities and costs used should reflect the full range of services for the functional area under review and cost weights should be updated regularly. If part of the costs of the functional area is not covered by the quantity indicator, it should not be assumed that the uncovered part follows the changes of the part that is covered. If no direct output volume method is applicable for this part, an input method should be used for it. Secondly, quantity indicators should be adjusted for quality change. For example, services should be sufficiently differentiated with the aim of arriving at categories that can be regarded as homogeneous. An aspect of quality change is then captured by changes in the proportions of different categories if the weights assigned to each category are frequently updated. In addition, the quantity indicator of each category can be augmented by an explicit quality adjustment factor. One way of identifying explicit quality adjustment factors is by reviewing the effects that the service has on measures of outcome.

15.123 It is recommended these volume indicators be tested for a substantial period of time with the aid of experts in the domain prior to their incorporation in the national accounts. Expert advice is particularly relevant in the areas of health and education, which usually dominate the provision of individual services. Further, the consequences of the estimates including the implications for productivity measures should be fully

assessed before adoption. Unless and until the results of such investigations are satisfactory, it might be advisable to use the second best method, the “input method”.

15.124 Measuring changes in the volume of collective services is generally more difficult than measuring the volume changes in individual services because the former are hard to define and to observe. One reason is that many collective services are preventative in nature, protecting households or other institutional units from acts of violence including acts of war, or protecting them from other hazards, such as road accidents, pollution, fire, theft, or avoidable diseases are concepts that are difficult to translate into quantitative measures. This is an area in which further research is needed.

15.125 When it is not possible to avoid using an input measure as a proxy for an output measure, the input measure should be a comprehensive one, it should not be confined to labour inputs but cover all inputs. In addition, explanatory information should accompany the national estimates that draw users’ attention to the methods of measurement.

Annex

B: ESA 10 – Chapter 10 Principles for non-market services⁵

10.28 The establishment of a comprehensive system of price and volume indices covering all supply and uses of goods and services involves a particular difficulty when measuring the output of non-market services. Such services differ from market services in that they are not sold at a market price and their value at current prices is calculated as the sum of the costs incurred. Those costs are: intermediate consumption, compensation of employees, other taxes less subsidies on production and consumption of fixed capital.

10.29 In the absence of a unit market price, the unit cost of a non-market service can be considered as the equivalent to the price. In fact, the price of a market product corresponds to the expenditure which the purchaser must incur in order to take possession of it, while the unit cost of a non-market service corresponds to the expenditure which society must incur in order to make use of it. Thus, where it is possible to define units of quantity for non-market services, it is also possible to apply the general principles for calculating volume and price indices which are outlined above.

It is generally possible to define units of quantity for non-market services which are consumed on an individual basis, such as education and health services, which means that the general principles must be routinely applied in the case of such services.

The method consisting of calculating volume by applying unit costs of the previous year to the quantities of the current year is called the output method.

10.30 It is difficult, however, to define units of quantity for collective non-market services, such as services in connection with general government, justice, or defence. In this case, therefore, other methods need to be used by analogy with the general method. This method defines volume on the basis of prices of the previous year, i.e., it defines volume as the expenditure which purchasers would have incurred if prices had not changed. This latter definition may be used when it is not possible to define a unit of quantity provided that it is applied, not to a unit of product, but to the expenditure as a whole. Since the value of a non-market service is determined by the costs involved, it is thus possible to calculate the volume by the value of the costs at base period prices, i.e., by the value at base period prices of intermediate consumption, compensation of employees, other taxes net of production subsidies and consumption of fixed capital. This method is known as the input method. The calculation in volume terms of the compensation of employees, consumption of fixed capital, taxes and subsidies on production is covered in the paragraphs which follow.

Even in the most favourable case of non-market services consumed on an individual basis, such as those of education and health, it is not always easy to distinguish homogeneous products. Indeed, the characteristics of such services are seldom defined in a sufficiently precise way for it to be possible to determine with certainty whether two different service units can be considered as being equivalent, i.e., if they have to be regarded as correspondent with one same homogeneous product or with two separate products. Two equivalence criteria can be retained by the national accountants.

The unit

cost criterion: two units of non-market services being considered equivalent if they have the same unit cost. This criterion is based on the idea that, collectively, those who benefit from public services are also those who decide and pay for them. For example, citizens decide on public services via their representatives and pay for them by their taxes. Under such conditions, citizens cannot be expected to pay different prices for service units that they consider equivalent. Thus, according to this criterion, two service units of different cost have to be regarded as corresponding to different products, and a non-market homogeneous product is characterised by the unicity of its unit cost.

The outcome criterion: two units of non-market services being considered equivalent if they give the same outcome. This criterion is based on the idea that two service units considered by citizens to be equivalent can however be produced at different costs because citizens do not check completely the production process of the services. The unit cost criterion is no longer then relevant and has to be replaced by a criterion corresponding to the usefulness of the non-market services for society.

As the outcome criterion often seems more relevant, a large amount of work has been completed to develop methods based on this criterion and research to improve them continues. In practice, such methods often result in the introduction to the volume calculation of correction coefficients applied to quantities; they take then the name of methods with explicit correction for quality.

The principal difficulty of implementation of such methods is related to the definition and the measurement of outcome. Indeed, measuring outcome presupposes having defined objectives, which is not so simple in the field of non-market services. For example, what are the objectives of the public health service: improving the state of public health or extending lifetime? Certainly, the two, but then how are various objectives weighed up when they are not equivalent? For example, what is the best treatment, that which makes it possible to live an additional year in good health or that which makes it possible to live two additional years in bad health? In addition, outcome estimates are often controversial, hence, in numerous countries, the controversies on improvement or deterioration of pupils' school performance are recurrent.

In the European Union, given the conceptual difficulties and the absence of consensus on output methods adjusted for quality (based on outcome), such methods are excluded from the central framework in order to preserve the comparability of the results. Such methods are reserved on an optional basis for supplementary tables, while continuing research. Thus, in the field of non-market health and education, the estimates of production and of consumption in volume terms have to be calculated on the basis of direct output measures — not adjusted for quality — by weighing up the quantities produced by the previous year unit costs of those services, without applying any correction to them to take account of quality. Such methods have to be applied to a sufficient level of detail, the minimum level being defined by Eurostat's *Handbook on price and volume measures in national accounts*.

Although the use of input-based methods is generally to be avoided, it is possible, in the field of health, to apply the input method when the variety of the services is such that it is practically impossible to determine homogeneous products. In addition,

explanatory information has to accompany the national accounts estimates that draw users' attention to the methods of measurement.

Annex C: Eurostat Prices and Volumes Handbook

2.4. Quality changes

2.4.1 The problem of quality changes:

The measurement of year-on-year price changes of goods and services is complicated by the fact that these goods and services may change between those years. The observed price changes may reflect changes both in characteristics and pure price changes. A value has then to be estimated for the change in the characteristics, in order for the price index to reflect pure price changes only. This is commonly known as the problem of quality changes.

The quality of a product is defined by its (physical and non-physical) characteristics. In principle, whenever a characteristic of a product changes, it is to be considered a different quality of the product. These changes in characteristics are to be recorded as changes in volume and not as changes in price (cf. ESA 2010, par. 10.18).

Valuing those quality changes is one of the most difficult problems in price and volume measurement. For a producer, quality change of an input will be related to its use in the production process and the profit that can be made, and it might be possible to more or less objectively put a value to the change. For a consumer, however, the quality of a product is essentially linked to the utility he or she gets out of it. Utility is not quantifiable, making the measurement of quality change for consumers a rather subjective matter. In economic statistics, one can only analyse aggregate consumer preferences as revealed by their purchasing behaviour, on the basis of observed market prices.

According to economic theory, in a situation of perfect competition the market price of a product will reflect both the purchaser's preferences and the producer's production costs. The market price will reflect exactly what the purchaser wants to pay for an extra unit of this product as well as what the producer needs to receive in order not to make a loss.

In this situation, a difference in price that exists between two products at the same time can be interpreted as the value that consumers attach to the quality difference between the two products. This implies that a higher price is associated with a higher quality. If shifts in the quantity of consumption occur between the different products this should be seen as a volume change, implying that the quality difference between the two products is exactly equal to the price difference.

Unfortunately, in most cases there is no perfect competition. Generally, price differences between different products can exist for various reasons. For example, consumers do not always have perfect information, leading them to buy at too high prices. Also, markets may not react promptly to the introduction of new products. It can happen that the 'old' products are being put on sale when new products are introduced, implying that the difference in price between the old and new products cannot immediately be used to value the quality difference. Other reasons for price

differences may be price discrimination and the existence of parallel markets. All the price differences mentioned here should be seen as price differences and not as quality differences (see ESA 2010, par. 10.14 – 10.18).

In some markets, e.g., for computers, it frequently occurs that new products have a higher quality but are introduced at the same, or a lower price than the old products. In such a case, the usual assumption that a higher price corresponds to a higher quality is no longer valid.

Therefore, market prices do not always properly reflect quality differences. The situation of perfect competition can however be used as the benchmark situation, i.e., the prices that would occur in a perfect competition situation would give us the correct quality evaluations. The correct quality adjustments can — in theory — be found by analysing the market prices supposing that perfect competition would prevail. The appropriateness of a particular method for quality adjustment therefore depends on the characteristics of the market in question: if a market is close to perfect competition, comparing market prices will usually give good results. If a market is further from perfect competition, e.g., due to the existence of a monopolist, perhaps other methods should be sought.

The limiting case of quality changes is when new products appear on the market. In such a case it is impossible to find prices that can be compared between the two years. It is important that new products are introduced into price samples as soon as possible after they appear on the market. At the moment of introduction, an estimate has to be made of the price of the new product in the period just before its introduction. The methods that can be used for making such estimates are not essentially different from the methods to deal with quality changes that will be described in the next section.

3.1.2. Non-Market Output

Input, activity, output, and outcome:

The problem of measuring prices and volumes for non-market output arises from the fact that by definition no market prices exist. For that reason, the value of non-market output at current prices is defined as the sum of costs minus market output or output for own final use of the unit. Without prices for the output, there are only two options for volume measurement: deflating inputs and direct volume measurement.

Deflating inputs assumes that the change in the volume of inputs is representative of the change in the volume of output. Using this assumption makes it impossible to analyse changes in productivity and will wrongly estimate the output change if this is different from the change in inputs.

Volume indicators can relate to:

Inputs, for example the number of employees. This would simply assume that twice as many government service employees would mean twice as much output, irrespective of how those additional personnel were deployed. The advantage of the method is the ease of implementation, and the ready availability of data. This method however ignores changes in productivity e.g., due to improved equipment (for example increased use of computers) or more efficient procedures.

A

possibility would be to complement input methods with adjustments for changes in productivity. It is sometimes argued that any productivity adjustment is better than none. However, there is no reason why, for example, a 1% productivity adjustment would be more plausible than a 0% adjustment. Productivity might just as well have declined.

The problem is that such adjustments are inevitably based on assumptions, which cannot be verified without genuine measurement of the output. And if output could be measured, then input methods would not be necessary. Another problem is that there might be double counting of productivity changes, if the quality changes of the inputs (e.g., the labour) were already taken into account (see paragraph 3.1.2.3).

Another argument is that, even if input methods are not perfect, they could at least be the basis for comparable estimates for the Member States: if the same assumption about productivity is made in all countries, for example if all countries assume no change in productivity or all assume +0.5%. However, a harmonised assumption about productivity does nothing to make the resulting estimates of output more comparable. The more different the developments in productivity among Member States, the less comparable are the results from using the same productivity change assumption.

Activity, for example number of operations in hospitals or number of patrols carried out by the police over a month or a quarter. Such data can often be found. Activity indicators reflect what the non-market units are actually doing with their inputs and are therefore closer to output. However, suppose for example that new improved forms of medical treatment reduce the number of operations necessary. Taking the number of operations as an indicator would imply a decrease of output, which does not seem appropriate in this case. However, for some collective services, activity indicators may be the only indicators of output that can be found.

Output, the preferred approach. However, it is not always easy to define exactly what the unit of output is. For individual goods and services, it is in principle possible to define the output since an actual delivery of that output takes place from the producer to the consumer(s) (see ESA 2010 paragraph 3.101). For example, for education, an output measure is the amount of teaching received by a pupil. For hospital services, an output measure is the amount of care received by a patient. For cultural services, an output measure is the number of theatre plays consumed. For collective services, however, there is no transaction between producer and consumer since the services are provided simultaneously to society as a whole. It becomes therefore very difficult to define the output. It is very difficult to say for example what the unit of output is of defence or police services.

Outcome, for example indicators of the level of education of the population, life expectancy, or level of crime. Such indicators can be influenced by factors that are unrelated to the activity and are not representative of output. ESA 2010 has rejected the outcome approach.

Output indicator methods

Suppose

the output of a non-market producer can be described as the number of units of products produced. Then we get the following relations:

In current prices:

number of units * unit costs = total costs = output in current prices

In volume terms: number of units * unit costs in the previous year = output in unit costs of the previous year

(For non-market products, the unit costs play the role of the price, see ESA 2010 paragraph 10.29.)

To measure output in current prices it suffices to calculate the total costs (i.e., no calculation of the number of units produced has to be made). However, output in volume terms (or in prices of the previous year) cannot be observed directly. In an output indicator method, the number of units produced and the unit costs in the previous year are estimated. In an input method, the output in unit costs of the previous year is approximated by deflating the current year costs or extrapolating previous year costs.

The following criteria can be formulated for the appropriate use of output indicators:

they should cover services produced by the producer that are provided to external users;

they should be weighted by the costs of each type of output in the previous year;

they should be defined at as detailed a level as possible

These are requirements that are not easy to meet in practice. However, increasingly, governments are collecting output data for public services, typically starting with services to individuals such as health and education, because they need this information for good management and to assure taxpayers that resources are being efficiently and effectively deployed. Some data sources on outputs have been available for many years because they are required for administrative reasons (for example pupil and patient numbers, numbers of social security and tax cases handled).

Data collection for NPISHs is generally more difficult because of their small size and often reduced reporting requirements to government. Nevertheless, data are available when NPISHs have to register with the government, and most NPISHs are required to keep accounts, even if these are less detailed than accounts for private businesses. Some countries undertake special surveys of NPISHs to gather data, and it is possible to use data from NPI satellite accounts, where they are prepared, to supplement the available data.

Taking quality changes into account

Taking quality changes into account for non-market output is not an easy task. In paragraph 2.4.2, general procedures for estimating quality adjustments were described. In many cases, such procedures use market prices to evaluate the quality differences between two products, since the market prices are supposed to reflect consumer preferences. For non-market output no market prices exist, making it very difficult to adjust for quality changes.

When

output indicators are used, it was said above that these indicators should be defined as detailed and homogeneous as possible, especially with regard to their unit costs. With a detailed breakdown of outputs, structural changes within the aggregate output - which is part of the quality change - will be included in the volume estimate. For example, when health care output is subdivided into a large number of treatments, then shifts between treatments will be included in the volume component. In this case, a treatment with higher unit costs will implicitly be seen as a treatment of higher quality.

There are three approaches to adjust for quality changes:

Direct measurement of the quality of the output itself. For example, a survey on the quality of public services could give indications of the changes in quality over time. For education, reports of school inspections could help. However, there are considerable difficulties. The information that is obtained can be subjective and may not be consistent over time or between units. Furthermore, there is a risk that the quality of the production process is evaluated rather than the quality of the output.

Measuring the quality of the inputs. For example, compensation of employees could be estimated such that quality changes in the work force are included in the volume component. An assumption is then made that the quality change of the inputs leads automatically to a quality change of the output. However, this assumption cannot be verified without actually measuring the quality of the output.

Using outcomes. The quality of the output lies in its results, i.e., in the outcome. For example, if the level of crime decreases, this could be due (probably in part) to improved effectiveness of the police. A practical problem with using outcome measures is that other external factors can also cause changes in outcome separately from changes in the direct output measures. For example, rising levels of affluence in society may cause a decrease in crime.

For non-market output of individual services, given the conceptual difficulties and the absence of consensus on quality adjustment methods, adjusting direct output measures for quality is excluded from the central framework of ESA 2010 — see ESA 2010 paragraph 10.30.

A, B and C methods

Individual services

For individual services, the preferred methods are those that measure output. Due to the difficulties to distinguish homogeneous products, input methods are allowed with one exception: for individual nonmarket education services, output measures without direct quality adjustment have to be used. They are specified in chapter 4.16.

For individual non-market health services, output measures without quality adjustment are recommended, if those indicators provide good coverage and are sufficiently detailed. They are specified in chapter 4.17. For other individual services, input methods can be used.

For example: in the case of education support services, an output method without quality adjustment or an input method can be used.

An output indicator method is an A-method if the indicators satisfy the criteria formulated in section 3.1.2.2.

If the criteria are not fully satisfied, for example if the level of detail could be improved, the output method becomes a B method. The input method is a B method as well for all individual non-market services except for individual education services.

If a volume indicator method measures inputs rather than outputs, or if the coverage of the output is not representative, this method is a C method. An output method with direct quality adjustment is excluded by ESA 2010 and therefore a C method. For individual education services an input method is a C method.

Collective services

For collective services, the classification of methods is broadly the same as for individual services. Due to the difficulty in defining the output of collective services:

- input methods are B methods for collective services;
- the use of volume indicators of activity is a B method.

The use of a single input volume indicator is not a B method: if input methods are used, they should estimate the volume of each input separately, taking quality changes of the inputs into account, in particular of compensation of employees. No additional productivity or quality adjustments to the sum of the volume of quality-adjusted inputs should be applied.

For each category of inputs (intermediate consumption, other taxes and subsidies on production, compensation of employees, and consumption of fixed capital) recommendations on measurement methods are given elsewhere in the handbook.

Annex

D: Method and data used for quality adjustment in the Public Service Productivity at ONS

Current Quality Adjustments applied to public service productivity output at the ONS

Quality adjustment has been implemented *only* in the public service productivity statistics following the recommendation (from 6.26 to 6.33) of Atkinson review (2005). The report states that the output of the government sector should in principle be measured in a way that is adjusted for quality, taking account of the attributable incremental contribution of the service to the outcome.

UKCeMGA (UK Centre for the Measurement of Government Activity) was established to carry out this work. It followed up the Atkinson Review by including some quality measures in productivity articles on Education and Healthcare. A consultation was held in 2006 and 2007 to hear from experts and give further legitimacy to the development process. This ended with publication of a strategy in 2007, *Measuring Quality as Part of Public Service Output*, which set out a conceptual framework for measuring the quality of public services.

Since February 2015, the annual estimates of public service productivity have been published in their current format. Since then, continuous development work has led to, among other improvements, three new quality adjustments for Public Order and Safety, Adult Social Care and Children's Social Care. The review and the expansion of quality adjustments is one of the development priorities of ONS, as highlighted in the Productivity development plan: 2021 to 2023.

Quality adjusted output in ONS Public service productivity

Service area quality adjusted	Service area non quality adjusted
Healthcare	Defence
Education	Police
Adult Social Care	Social Security Administration
Children's Social Care	Other
Public Order and Safety	

The current method of quality adjustment follows a five-step framework that can be summarised as follow:

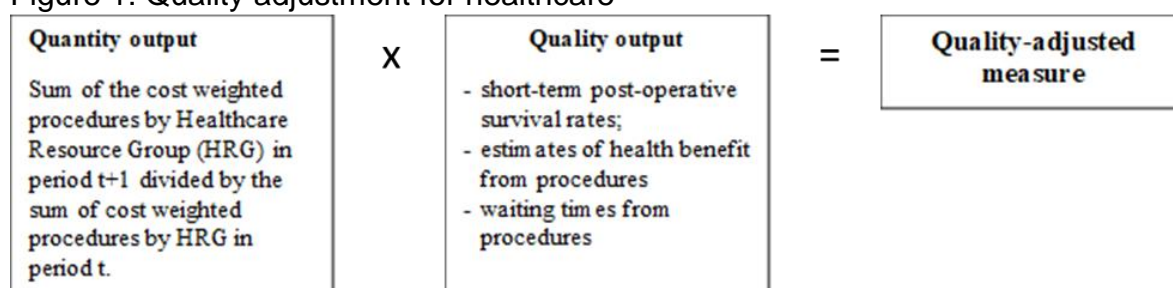
- **Define dimensions of quality for the service area:** think about what the service does and what its desirable outcomes are. How might fulfilling these outcomes be expressed with data? How attributable to the service are these desirable outcomes?
- **Decide what can be measured:** in the light of the outcomes and potential measures identified, what data are actually available? Do these meet the essential statistical and theoretical criteria?
- **Consider the limitations of each quality indicator:** Which limitations or caveats are there with each one? Which limitations can be accounted for by including other adjustments or by adapting the source data? Which data

sources fall under acceptable error margins, and therefore should be dismissed?

- **Design the quality indicator indices:** Regularly check that the index meets the previously identified criteria for suitable use and that the data represent quality change in the appropriate dimension. Try several different methods to find the best, if necessary, with different adjustments and weights in each, for example. Use triangulation evidence to assess alternative options involving consulting with stakeholders and sectoral experts.
- **Process and aggregate the data:** First, the adjustment or adjustments for each output component, then for the combined output series, and finally include in the productivity calculations.

The example of the calculation of quality adjustment for healthcare is shown below.

Figure 1: Quality adjustment for healthcare



Because healthcare includes several quantity activities and a number of quality adjustments, each component leads to the calculation of a multiplier (one plus a growth factor) and these factors are multiplied together and applied to the basic cost weighted activity measure to derive a quality adjusted measure for that activity, which are then aggregated.

Healthcare

A quality adjustment is applied to the quantity output index where a positive quality adjustment indicates that the quality of healthcare services provided, as defined by the selection of indicators used in the quality adjustment, has improved. A quality adjustment is then applied to UK output, based on the following elements and data from England.

Elements within the hospital and community healthcare sector, which constitute the hospital procedures quality adjustment and are applied to output using a dataset provided by the Centre for Health Economics at the University of York include:

- short-term post-operative survival rates, derived from Hospital Episodes Statistics (HES); short term survival is used to adjust day cases, elective inpatients, and non-elective inpatients
- estimates of health benefit from procedures, derived from research studies, ONS Life Tables and Patient Reported Outcome Measures; we apply this adjustment to day cases, elective inpatients, and non-elective inpatients
- waiting times from HES; waiting times are used as a quality adjustment for day cases and elective inpatients

Elements within the hospital and community healthcare sector include:

- national patient experience surveys, from NHS England, used as an adjustment for day cases, elective inpatients, non-elective inpatients, emergency care and mental health

Elements within primary care services are:

- aggregate data on clinical measures recorded on GP practice computers, from the quality and outcomes framework, used to quality adjust the GP consultations

Hospital and community health services (HCHS) and primary care services are quality adjusted, but no quality adjustment is applied to GP-prescribing or non-NHS provided services.

Education

Attainment for primary and secondary school

Output in primary and secondary schools, city technology colleges (CTCs) and academies, which make up the majority of education output, are adjusted for quality using different attainment measures for each of the devolved nations. As exam performance varies across geographical areas and because education is a devolved policy area that affects the courses studied and exams taken, different quality adjustments are applied to output in each country separately.

Using a “cohort split” approach, attainment data are used as a proxy for change in the quality of education, and the GCSE (or equivalent) results for a given year were applied to quality adjust the output of primary and secondary education for that year. Reception year (in England and Wales), P1 (in Scotland) and Year 1 (in Northern Ireland) are also taken into consideration in these statistics.

For attainment data released in the academic year ending 2019, 15% is applied retrospectively to the primary school years (2% of teaching when that cohort were in years reception to 5, and 3% in year 6 from academic years ending 2008 to 2014). The remaining 85% is added retrospectively to secondary school with 5% in year 7 (academic year ending 2015), 10% in year 8 (academic year ending 2016) and so on, with academic year ending 2019 receiving 30% of this score. Where there are incomplete years, that is, where students have received teaching, but have not completed GCSE-level examinations, available contributions are rescaled to total 100%.

In the [latest publication](#), we extended the quality adjustment for primary schools by introducing Key Stage 2 attainment measures, alongside existing measures. These are nationally representative, publicly available measures of attainment of those aged 11 years across the UK, which allow us to consider attainment in literacy and numeracy skills at the end of primary schooling. Consistent with the approach for GCSE or equivalent attainment, we apportion primary school attainment equally between the seven years of primary schooling, since the year in which the test is taken is not the only year that contributes to the attainment. 15% of the national curriculum assessment attainment at Key Stage 2 is apportioned retrospectively to each year of primary school from Reception (or equivalent) to Year 6.

Disadvantaged attainment gap index at Key Stage 2

Disadvantaged pupils are defined by the DfE as those who attend primary school and have been eligible for free school meals at any point in the last six years, children looked after by a local authority and children who left local authority care in England and Wales. Equity of attainment is an important priority for the UK education system. For more information, see [Improved methods for total public service productivity: total, UK, 2019](#).

This quality adjustment is based on data for England, as no equivalent measures are available covering other parts of the UK. As such, we have applied it to the output measure for all parts of the UK.

The disadvantaged attainment gap index is published by the DfE. As the index approaches 0, this reflects the gap between disadvantaged pupils and their peers being closed. Therefore, to be consistent with quality adjustments in public service productivity, the index growth is inverted such that a fall in the index (as it gets closer to 0) reflects an improvement in quality.

To weight the disadvantaged attainment gap quality series together with the other quality metrics in the education service area, the proportion of primary school funding that is specifically pupil premium funding is used. The [pupil premium is defined as](#) “funding to improve education outcomes for disadvantaged pupils in schools in England.”

Bullying

Our education quality output measure also includes a bullying quality adjustment based on data from the British Household Panel Survey (BHPS) and its successor survey, Understanding Society (USoc). We approximate the severity of bullying by determining the mean life satisfaction of students who reported being bullied (or worried about being bullied) and the mean life satisfaction of students who did not report any bullying. From this, we derive an index, which is then incorporated into the current quality index by weighting the growth rate of the index with the growth rate of the current attainment index. For more information on the introduction of the bullying quality adjustment index, please refer to [Improved methods for total public service productivity: total, UK, 2018](#).

Qualified teacher status

The delivered quantity of initial teacher training (ITT) courses is also adjusted for quality, but the cohort method is not applied. In this case, the proportion of students who achieve qualified teacher status (QTS) each year is used as a quality indicator. ITT quantity in each geographical area of the UK is adjusted using the QTS award rate for England, which is provided by the DfE.

Final index

Several sources have been used to create the quality adjustment for education.

Primary

school attainment sources are:

- national curriculum assessments at Key Stage 2, DfE for England
- Key Stage 2 national level results by subject and year, Welsh Government for Wales
- school information dashboard – primary, Scottish Government for Scotland (historic series uses the Scottish Survey of Literacy and Numeracy, the Scottish Survey of Achievement, and the National Survey of 5 to 14 years Attainment)
- levels of progression attainment (historic series uses levels of attainment), Department of Education Northern Ireland (DENI) for Northern Ireland

GCSE, or equivalent, attainment sources are:

- attainment 8 in Key Stage 4 performance, DfE for England
- capped 9 in examination results for pupils aged 15 or 17 years, Welsh Government for Wales
- national 5s and Skills for Work and Personal Development courses pass rates, Scottish Qualifications Authority for Scotland
- threshold measure including English and Maths, DENI

Disadvantaged attainment gap index at Key Stage 2 sources are:

- national curriculum assessments at Key Stage 2, DfE for England

Bullying sources are:

- Understanding Society and British Household Panel Survey

Qualified teacher status sources are:

- initial teacher training performance profiles, DfE

Estimates of quality-adjusted output are carried out in several steps.

Time series data are compiled using:

- pupil numbers, which are adjusted for attendance at primary, secondary and special schools the level of expenditure in each educational service
- the attainment at Key Stage 2, disadvantaged attainment gap index in primary school, GCSE level and the ITT QTS award rate as outlined previously
- the bullying index as outlined previously

The cohort method is applied to the relevant quality-adjustment measures for schools, and these, along with ITT pass rates, are converted into indices. The separate quality indices are then combined using weights informed by the literature (or funding information in the case of the disadvantaged attainment gap index) to create a final quality index for schools.

A chain-linked Laspeyres volume index of quality-adjusted output is produced for each educational sector and aggregated to a UK level.

When education sectors are aggregated together using their relative cost weights, an overall UK level, chain-linked Laspeyres volume index of quality-adjusted output is calculated.

Adult social care

Separate quality adjustments have been developed for community care, and residential and nursing care, both using data from NHS Digital's [Adult Social Care Survey \(ASCS\)](#) from FYE 2012 onwards. The ASCS is a sample survey of clients in local authority supported care in England. Coverage includes clients whose care is partly or entirely funded by a local authority, including those in receipt of direct payments, or clients in local authority organised care who are fully self-funding. Full details of this can be found in Section 6 of [public service productivity: adult social care, sources and methods, 2019 update](#).

Using the data from the ASCS, it is possible to calculate how well clients' needs are met (on a scale from no needs met to no unmet needs) across eight domains:

- control
- personal care
- food and nutrition
- accommodation
- safety
- social participation
- occupation
- dignity

Each level of response on care needs across each of the eight domains is then weighted to account for its importance in affecting quality of life, using weights developed from a separate survey of community care users.

In addition, factors predominantly outside the influence of ASC services, but which affect the likelihood of needs being met, are controlled for to derive the change in social care-related quality of life resulting from changes in ASC service quality.

For community care, factors from the calculations used in the ASCOF are applied to the person-level data in the ASCS to remove the influence on care-related quality of life of clients' age, health status, suitability of clients' home for meeting their needs and clients' ease of travelling around outside in their local environment. As the factors used in ASCOF only relate to community care users, for residential and nursing care, a regression model is used to calculate the impact of ASC services on care-related quality of life, controlling for these external factors.

The quality adjustment is applied separately for residential and nursing care, community care, and for the different client groups listed previously.

Public order and safety

Quality adjustments are not applied to fire protection or county courts services, which deliver civil cases, as they are deemed to have different outcomes to the criminal justice elements.

The recidivism adjustment

The recidivism adjustment approximates the effect the Criminal Justice System (CJS) has on reducing the volume and severity of further crimes being committed by those who have gone through it.

This adjustment is composed of three parts, the first being the change in the number of proven re-offences committed by adults and juvenile offenders categorised between crime types. An adjustment is made to adult offenders, to account for differences between cohort characteristics and their likelihood to re-offend. No such adjustment is made for juvenile offenders after 2005. The final adjustment made provides a weighting by which to aggregate together all re-offences. This weighting is based upon the relative severity of the re-offence and is derived from the ONS's [Crime Severity Score for England and Wales](#).

[Data on proven reoffending from the Ministry of Justice](#) has historically been used, alongside other measures, to quality adjust output in the criminal justice system. However, data on reoffending for the last quarter of 2018 and all of 2019 have been affected by the coronavirus (COVID-19) pandemic, as it looks at proven reoffending that occurs within the following year. Proven reoffending has been affected by increased backlog in courts as well as behavioural changes related to lockdowns. The ONS has therefore made a small adjustment to reoffending data in Quarter 4 (Oct to Dec) 2018 to account for this and has held reoffending rates constant for the 2019 period. This is on the basis that it cannot be used as a comparable quality measure during the coronavirus pandemic.

The prisons safety adjustment

The prisons safety adjustment relates to the number of incidents of assaults, self-harm and deaths that occur in prison custody.

We measure the number of incidents per 1,000 prisoners, which are grouped into “Severe”, “Less severe” and “Those resulting in a death”. These groups are subsequently weighted and aggregated together based on their relative cost. This is achieved by using the total cost to society of workplace injuries as a proxy, taken from the Health and Safety Executive (HSE).

The custody escapes adjustment

The escape adjustment relates to ensuring prisons fulfil the role of public protection and is applied to activities used to measure the output of the prison service.

The measure is based on changes in the difference between the number of escapes and a baseline of 0.05% of the England and Wales prison population – a historic target used by the MoJ. The purpose of this is that as the absolute number of escapes approaches zero, the relative change year-on-year would have a disproportionate effect on a non-baselined quality adjustment index.

The courts' timeliness adjustment

The courts' timeliness adjustment relates to the average time taken for criminal cases to be taken to completion, on the basis that the delivery of a sentence in a timely manner is favourable. However, there is currently no adjustment made to reflect whether there has been fair treatment of the suspect or victims, or to allow the appropriate time for preparations of criminal cases with differing levels of severity or complexity.

For magistrate courts, the measure is based on the mean average time of charge and laying of information to completion. For Crown Courts, the measure captures the average waiting times experienced by all defendants and the mean time from main hearing to completion. As implemented, the measure accounts for changes in the average time taken to completion by criminal courts because increases in volume may reflect a worsening.

Combining the components

For each component, we calculate an overall growth factor to be applied to the basic activity index. For those areas where multiple adjustments are applied, the growth factors are applied on a weighted average basis (Table 2 outlines the weights used). To then aggregate together all the components of public order and safety (POS) – including non-quality adjusted components – they are cost-weighted together to produce an aggregate index of POS quality adjusted output.

Children's social care

Quality adjustment is applied to the quantity output index with a positive quality adjustment indicating that the quality of children's social care (CSC) services provided has improved. The quality adjustment series included in the CSC service area is applied to the corresponding directly measured activities.

Quality adjustment data for England comes from the DfE, and for Wales, quality data comes from the Welsh Government. Where quality adjustment data are not available for the devolved administrations, England data is used instead. This particularly affects Scotland and Northern Ireland where suitable quality adjustment data are not available.

Quality output measures used in CSC

Re-referrals and re-registrations, which start in 2012.

- These data are applied to the safeguarding activity of CSC.
- Children in need re-referral rate, measured as the percentage of children referred within 12 months of a previous referral using data from the DfE in England and Welsh Government data for Wales.
- Child protection plans starting in the year 2012, which were a second or subsequent plan, measured as the percentage of child protection plans that were repeat plans using data from the DfE in England; up to date data are not available for Wales, and therefore Wales safeguarding activity uses the England re-registrations quality adjustment.
- Since safeguarding activity is not measured for Scotland and Northern Ireland, no re-referrals and re-registrations quality adjustment is applied to them.

- This measure is lagged by one year on the basis that the quality of the service in a particular year may be lower if in the following year there is a higher rate of re-referrals and re-registrations.

Placement stability, which starts in 2010.

- These data are applied to the LAC activity of CSC.
- Number of placements a child has been placed in in the last year; measured as the percentage of LAC with two or more placements during the year using data from the DfE in England and Welsh Government data in Wales; no suitable data is available for Scotland and Northern Ireland, and therefore the England placement stability quality adjustment is applied to these countries.
- An increase in placement stability is treated as an increase in quality.

Care leavers, which starts in 2014.

- These data are applied to the care leavers activity of CSC.
- The percentage of care leavers living in suitable accommodation; this data is only available for England using data from the DfE.
- Percentage of care leavers that are not in employment, education, or training (NEET); this data is available from the DfE for England and the Welsh Government for Wales.
- Since care leavers' activity is not measured for Scotland and Northern Ireland, the care leavers quality adjustment is not applied.

For series whereby an increase in the measure reflects worse outcomes, the inverse is taken so that the quality adjustment index reflects a fall in quality.

Quality adjustment is applied to each individual area of CSC activity (for safeguarding, non-secure accommodation, secure accommodation, adoptions, special guardianships, and care leavers). For safeguarding and care leavers for England, each have two indicators of quality, which need to be combined into a single index of safeguarding quality and care leavers quality. An equal weight is attributed to the suitable accommodation measure and the NEET measure for care leavers. For safeguarding, weights for re-referrals and re-registrations correspond to the percentage of safeguarding expenditure on children in need and children on child protection plans, respectively (84% and 16% in 2019).

A chain-linked Laspeyres volume index of quality-adjusted output is produced for safeguarding, care leavers and secure and non-secure accommodation by country. No quality adjustment is applied to adoptions or special guardianship orders, these are chain-linked Laspeyres volume indices.

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