

## Thinking about wellbeing inequality

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**What Works Centre for Wellbeing**

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## About the What Works Centre for Wellbeing

We are an independent collaborating centre and the aim of our work is to improve wellbeing and reduce misery in the UK. We believe that this is the ultimate goal of effective policy and community action. By accelerating research and democratising access to wellbeing evidence, we develop and share robust evidence for governments, businesses, communities and people to improve wellbeing across the UK.

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## Introduction

Widely shared prosperity is one of the most important sources of legitimacy and success of liberal democracies and flourishing societies.

Governments of all kinds have a stated goal to reduce inequalities - albeit a goal pursued with different levels of fervour, and conceptualised differently, by different politicians even within the same broad party political grouping.

For the UK Government, reducing disparities is the overarching ambition set out in its Levelling Up White Paper:

“Taken together, these missions will help achieve the overarching ambition to improve well-being in every area of the UK, with the gap between top performing and other areas closing (Mission Eight)” Executive Summary p.12

This approach to public policy aims to address inequalities in subjective wellbeing alongside inequalities in objective factors to improve lives.

### Wellbeing frameworks

Wellbeing frameworks can be a useful lens to look at fairness and help understand how impacts differ between people, which is key to tackling inequality.

The OECD, for example, outlines three ways to measure inequality:

- 1) Dispersion or “vertical inequalities” - the total size of gap between people at the bottom and people at the top
- 2) Gaps between groups or “horizontal inequalities” - by e.g. age, gender, education
- 3) Disparities - the share of people falling below a given standard of living

For a recent example of how this kind of framework has been applied in practice, view our [Covid WIRED](#) research.

### Appraising the fairness of a society

In this paper, we consider wellbeing inequality and how it could be measured.

To fulfil public policy ambitions of reducing disparities and increasing wellbeing we need ways to accurately and consistently measure inequalities, track progress, and assess success.

First, we discuss a number of challenges in attempting to produce a metric (or metrics) of wellbeing inequality before examining the limitations of income metrics.

We then introduce four different possible ways to measure inequalities in subjective wellbeing:

1. Standard deviation
2. Ratio of Low/ High
3. Gini Coefficient
4. Shannon Index

Finally, we use regional data from the UK to allow for side-by-side comparisons in practice. We have used regional UK data for simplicity - and to avoid unhelpful comparisons at the level of administrative responsibility, for example at local authority level.

This paper does not arrive at a definitive conclusion about how to measure inequality of wellbeing, but instead hopes to prompt a discussion that will eventually lead to an agreed measure.

## The challenges of producing a metric of wellbeing inequality

The UK has a long-established history of systematically measuring the subjective wellbeing of its citizens. The Office for National Statistics has captured measures since 1991, and these were harmonised in 2010.

Since then, life satisfaction disparities have been included as economic measures in public financial policy documents - including the budget - along with pay and productivity.

But measuring wellbeing inequality is more challenging than measuring income or wealth inequality. Here we look at why.

### Subjectivity

Harmonised measures, like the ONS4 questions - which capture happiness, life satisfaction, worthwhileness and anxiety, are subjective. If I am more dour in my temperament than you, your score of eight might mean the same thing as my score of six. In contrast, £30,000 is £30,000.

### Scale

Similarly, shifts along a scale do not necessarily equate to the same change in wellbeing - the gap between one and two may need not be the same as the gap between eight and nine. Whereas the gap between £10,000 and £20,000 is always the same as the gap between £100,000 and £110,000 - and the marginal income can be used to buy the same basket of goods.

Types of wellbeing are not fungible in the same way that money is. Income from capital vs income from labour are denominated in the same amounts, and can, to an extent, be

traded for each other. There is no way of meaningfully comparing worthwhileness and life satisfaction scores, and no market that allows me to trade my high life satisfaction for a life that is a bit more worthwhile.

## Differences in severity

We expect wellbeing inequality to be less severe in some ways than income or wealth inequality. The Easterlin paradox suggests that there are very limited wellbeing gains to be had after a certain point in terms of income, and, less scientifically, the concept of 'rock bottom' resonates with many. Income and wealth have no theoretical maxima or minima - no matter how rich, or how poor, you are, you can always get richer or poorer.

## Censoring

Wellbeing measurement experiences censoring due to questions taking values on a 0-10 scale. If, for example, someone's life satisfaction is scored at a zero on Tuesday, and then their life gets less satisfying in some way on Friday, they are unable to score in this decrease. Similarly, if someone indicates that their happiness score is 10, and something makes them happier, this cannot be scored in either. Wellbeing is, essentially, capped. By contrast, income or wealth can continue to rise, with no theoretical upper limit, and, while people cannot experience negative income, they can experience negative wealth due to debts.

## Discreteness

Wellbeing scores are collected using a discrete measurement - that is, respondents can only choose integers between zero and 10. However, their cardinal wellbeing - the underlying real value that the survey measures aim to capture - is likely to be continuous. This makes wellbeing measurement 'lumpy', with many true values of a person's wellbeing being categorised under a single value.

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Taken together, these different challenges mean that:

- It may be harder to estimate wellbeing inequality in a meaningful way than income inequality.
- Estimates of wellbeing inequality are likely to be lower bounded than those for other things like wealth and income, making them less comparable.

These challenges, however, are not as severe as they might initially seem, and the neat properties of money conceal its weaknesses as a metric. This means a wellbeing inequality measure provides much richer information than a focus on income inequality alone.

## The limitations of economic metrics

Most obviously we can think of **money's cardinality** - the extent to which it offers an objective measure, and where bigger numbers always mean more money than smaller ones. £10,000 can be used to purchase the same bundle of goods whether you are poor or rich. With few exceptions, the prices for goods do not vary based on how much money the person buying them has. However, as any economist will tell you, we don't use money to buy goods and services, we use it to buy utility - for which goods and services are an intermediate step. Any 'utility function' that maps those goods and services onto the utility that they produce will experience diminishing marginal returns; the more of something you have, the less valuable each new unit is in terms of the utility it provides. This is true both within a particular good - you don't enjoy your fourth cup of tea as much as your first - and across different goods<sup>1</sup>.

**Measures of income also make things look the same which are not.** Take, for example, two individuals earning £30,000 a year. One of them might be married, while the other is not. One may have children, or caring responsibilities for an elderly relative. One might live in London, where property (and everything else) is expensive, and the other might live in Cumbria, where things are on average cheaper. A whole range of other factors about their lives will influence what that income buys, both in terms of stuff, and in terms of the wellbeing outcomes it produces.

**Measures of income also miss out on structural and social factors.** Americans on average earn quite a bit more than their British counterparts, but also need to pay for health insurance. The same income goes further if you live in a city with good, cheap public transport links, than if you live somewhere where a car is necessary. Being the poorest of your friends feels worse than being the richest, even if your income is the same and all that has changed is your social group.

Money, either in the form of income, wealth or spending, seems like a natural way of measuring the prosperity and equality of a country - only because it is convenient, and only via a tautology - it is important to measure money because money is important.

Considering income as the unit of measurement is also conservative when we consider the remedy for inequality: redistribution. The economists' concept of a Pareto improvement justifies a change in allocation of goods when one party can be made better off without making another worse off<sup>2</sup>.

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<sup>1</sup> This can be demonstrated using the mathematical proofs favoured by economics, but can also be expressed intuitively. If you're at a cake shop, you should choose the cake that gives you the most utility first, and then the cake that gives you the second most utility second. If the second cake you eat gives you more utility than the first - then you should have chosen it first!

<sup>2</sup> The related, but less commonly used concept of Kaldor-Hicks improvement allows for transfers between individuals as long as the winners could compensate the losers. This is less restrictive than Pareto, but is still more conservative for income than wellbeing.

If money is our unit of measurement, then this is impossible. Taking £1 from one person and giving it to another, regardless of how rich the first and how poor the second, can never be a Pareto improvement.

The “Easterlin paradox” changes this. It shows that increases in wellbeing diminish as we get richer and that additional wellbeing is almost impossible to achieve with increases in income beyond a certain point. The very richest can have income taken away from them without loss of wellbeing/utility, and with large compensatory gains to the poor in wellbeing terms.

## Potential ways of measuring inequality

Whilst apples-to-apples comparisons of inequalities between wellbeing and other measures is likely not possible, different localities, societies and communities could be compared within wellbeing.

In this section, we describe four ways of measuring wellbeing inequality, based on approaches used to measure inequality or concentration in other fields.

### 1. Measuring Standard deviation

A first and easy port of call might be to take a simple measure of spread - the standard deviation - of wellbeing within an area, community, or society. This is the approach taken by What Works Centre for Wellbeing's previous report on [wellbeing inequality in Britain](#). It has the advantage of being relatively straightforward to understand and captures a measure of the dispersion of wellbeing through a society in a single figure.

A standard deviation is calculated as:

$$\left( \frac{\sum_{i=1}^N \sqrt{(x_i - \bar{x})^2}}{N} \right)$$

Standard Deviation experiences some of the challenges associated with discreteness. For example, two distributions can have identical standard deviations (and even means), while experiencing qualitatively very different levels of inequality. A small number of people experiencing both abject misery and total bliss, with everyone else clustered closely around the mean, will have the same standard deviation as one in which everyone is just a little further away from the mean. Moreover, if we are most interested in people with very high vs very low levels of wellbeing, then the standard deviation might not be very useful.



## 2. Ratio of low and high

An alternative approach, if we are mainly concerned with extreme inequalities, is to capture the ratio of the proportion of people with “Low” life satisfaction, sense of worthwhile and happiness and high anxiety, to the proportion with “High” life satisfaction, sense of worthwhile and happiness and low anxiety. As an approach, this captures more of what we might instinctively think of as problematic inequality - the difference between extreme wellbeing poverty and extreme wellbeing affluence.

The thresholds for the ONS4 are detailed in table 1.

**Table 1: Personal well-being thresholds**

Life satisfaction, worthwhile and happiness scores		Anxiety scores	
Response on an 11 point scale	Label	Response on an 11 point scale	Label
0 to 4	Low	0 to 1	Very low
5 to 6	Medium	2 to 3	Low
7 to 8	High	4 to 5	Medium
9 to 10	Very high	6 to 10	High

Source: Office for National Statistics<sup>3</sup>

As with the standard deviation, this gives a single figure for each measure of wellbeing that is easy to understand and interpret.

It can be calculated as:

$$\frac{p(\text{Low wellbeing})}{p(\text{High wellbeing})}$$

The higher the number is, the more problematically unequal a society's well being arguably is, with figures over 1 indicating that more people have low wellbeing than high.

Of course, a very low value (with many people experiencing high wellbeing and few experiencing low wellbeing), is also unequal in its own way.

A disadvantage of this ratio is that it is insensitive to scale. For example, a society in which 1% of people have low wellbeing and 10% have high wellbeing will have the same score as one in which 0.1% of people have low wellbeing and 1% of people have high wellbeing.

<sup>3</sup>

<https://www.ons.gov.uk/peoplepopulationandcommunity/wellbeing/methodologies/personalwellbeingsurvey/userguide>

### 3. Gini Coefficient

The Gini Coefficient is a measure of dispersion within a distribution. It can be used for any frequency distribution, but is commonly used to measure income inequality at a national or subnational level.

The Gini Coefficient is calculated by measuring the area between the line of equality (a 45 degree line), and the Lorenz curve<sup>4</sup>.

If a society is completely equal, then everyone has the same amount of wealth or income, and so the Lorenz Curve matches the line of equality perfectly, and the Gini coefficient is zero.

If one person has all the wealth and nobody else has any, then the Lorenz curve is level with the y axis until the very end, and the Gini coefficient is one.

In a continuous distribution, like income, the Gini Coefficient is calculated through integration. For a discrete distribution like wellbeing it can be calculated arithmetically:

$$G = \frac{\sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|}{2 \sum_{i=1}^n \sum_{j=1}^n x_j} = \frac{\sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|}{2n \sum_{j=1}^n x_j} = \frac{\sum_{i=1}^n \sum_{j=1}^n |x_i - x_j|}{2n^2 \bar{x}}$$

### 4. Shannon Index

The Shannon Index is a measure of concentration or diversity within a sample or population. It is widely used in ecology, and also has applications in economics. For example, in looking at the diversity of an economy or the extent to which one firm is dominant in an industry or one industry is dominant in an economy.

The index can be used to calculate inequality in the sense of people's wellbeing not taking the same value as each other, based on the idea that if everyone had the same wellbeing score, then there would be no 'diversity' and hence no inequality.

The Shannon Index, unlike the Gini Coefficient, is also value free, where one per cent of the sample having a wellbeing score of one is weighted identically to one per cent of the sample having a wellbeing score of 10<sup>5</sup>.

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<sup>4</sup> The Lorenz curve shows the share of a country's population along the x axis and the share of national income (or wealth) along the y axis. See:

[https://en.wikipedia.org/wiki/Gini\\_coefficient#/media/File:Economics\\_Gini\\_coefficient2.svg](https://en.wikipedia.org/wiki/Gini_coefficient#/media/File:Economics_Gini_coefficient2.svg)

<sup>5</sup> Calculating a Gini Coefficient, the latter group will have a much higher 'proportion' of total wellbeing than the former, and so contribute more to the total Gini coefficient.

As such, although it measures dispersion well, it does not distinguish between, for example, a society in which 50% of people score each of nine and 10, and one in which 50% of people each score one and 10, although we might view the latter as more unequal than the former.

Given the lack of cardinal wellbeing values, this value-freeness may be a virtue, rather than a hindrance.

Being based entirely on the proportion of a sample that takes each value, there is no automatic maximum for all Shannon indices. Instead, the maximum is provided by the number of values that are taken in the sample. Although this might make interpretation challenging in an ecological context, it means there is a known maximum Shannon score for any wellbeing measure denominated on a zero to 10 scale.

The Shannon Index is calculated as:

$$H' = - \sum_{i=1}^R p_i \ln p_i = - \sum_{i=1}^R \ln p_i^{p_i}$$

## Putting the approaches into practice

So far, we have identified four different ways that we could approach measuring wellbeing inequality. Next, we put these different measures into practice.

Using local authority level data (via the Annual Population Survey) or government department level data (via the Civil Service People Survey), is appealing, but risks creating a 'league table' from metrics of inequality which are not reliable and require discussion.

Instead, we make use of publicly available data on regions of the United Kingdom, in the hope that these will show our working and allow for side-by-side comparisons of the scores and the rankings they produce, without negative attention being drawn.

Table 2 shows the inequality scores for each region of the UK suggested by each of our four measures, while Table 3 shows the ranking of those scores for each metric.

**Table 2: UK regional inequality scores**

Area Names	Standard Deviation	Low/High Ratio	Gini	Shannon Index
UNITED KINGDOM	1.31	0.19	0.121	1.84
ENGLAND	1.3	0.19	0.12	1.83
North East	1.39	0.24	0.13	1.88
North West	1.35	0.2	0.125	1.86
Yorkshire and the Humber	1.3	0.19	0.121	1.83
East Midlands	1.34	0.17	0.124	1.85
West Midlands	1.33	0.21	0.124	1.84
East of England	1.26	0.17	0.116	1.81
London	1.27	0.2	0.118	1.82
South East	1.24	0.17	0.114	1.79
South West	1.28	0.2	0.118	1.82
WALES	1.38	0.21	0.128	1.87
SCOTLAND	1.33	0.25	0.125	1.85
NORTHERN IRELAND	1.3	0.15	0.12	1.83

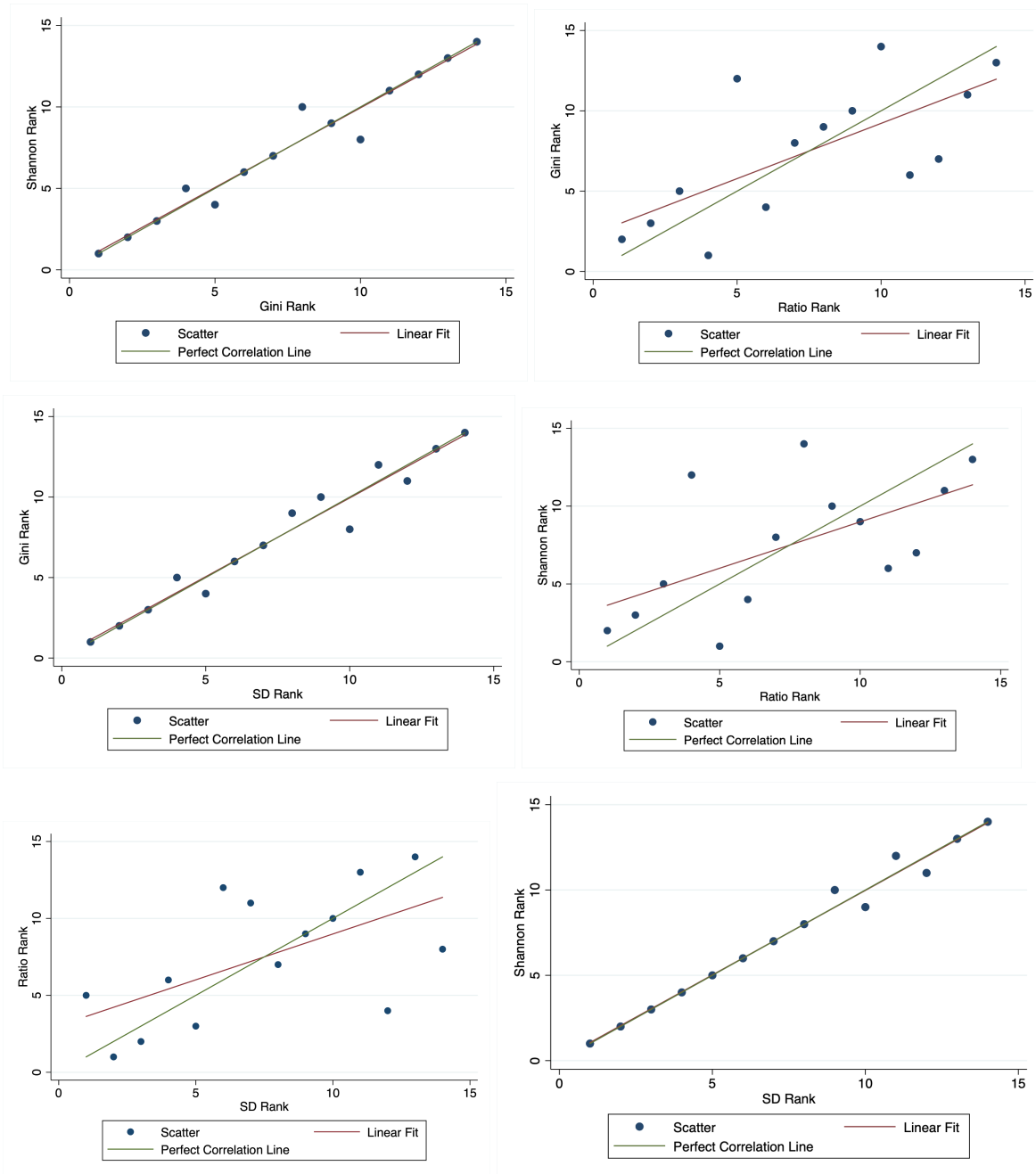
**Table 3: UK area rankings for each metric**

Area Names	SD Rank	Ratio Rank	Gini Rank	Shannon Rank
UNITED KINGDOM	7	8	7	7
ENGLAND	10	10	9	9
North East	1	2	1	1
North West	3	5	3	3
Yorkshire and the Humber	9	9	8	10
East Midlands	4	12	5	4
West Midlands	6	4	6	6
East of England	13	11	13	13
London	12	6	11	11
South East	14	13	14	14
South West	11	7	12	12
WALES	2	3	2	2
SCOTLAND	5	1	4	5
NORTHERN IRELAND	8	14	10	8

## Discussion

As we can see from these tables, the values for each of these measures are relatively small, and fairly close together compared to, for example, what we might expect to see in terms of gini coefficients or standard deviations on income. Given the number of regions, and the use of only a single time point in these experimental statistics, it is not possible to know what the plausible set of ranges that *could* be taken are, and hence to give any sense of whether the differences are large.

Nonetheless, as the ranking table shows, the Standard Deviation, Gini Coefficient, and Shannon Index produce very similar rankings of regions. The largest difference between these indices is two - the difference between Yorkshire and the Humber's rank for Gini (8) and its rank on Shannon (10), and Northern Ireland's SD and Shannon Ranks (8) and its Gini rank (10). This suggests that although the metrics are different, they are capturing at least some of the same information. The ratio approach produces results that are fairly well correlated with the other scores, albeit less so than the other three. These correlations are shown in figure 2, which show each of the six sets of correlations between the indicators. The correlations between SD, Shannon and Gini are high - each above 0.97 - while the Ratio is less highly correlated (between 0.59 and 0.68) with the other three.



**Figure 2: Correlations between the indicators**

## Excluded metrics

Alongside the other measures contained in the paper, we considered a number of alternatives, but have not included them here based on limitations of the data available. An ideal metric for wellbeing inequality would be one that does not only measure inequality in wellbeing, but also the contribution to wellbeing and its inequality that local authorities or other actors play. This type of metric would be similar to the Progress 8 metric used in schools, which captures the 'value add' of a secondary school by considering progress between year 7 and year 11. In order to create such a metric, however, we would need a cardinal measure of wellbeing, or at least a metric which is consistently ordinal between individuals; a baseline measure of wellbeing; and longitudinal data. As such, it is not practical at this stage to measure wellbeing in this way.

## Conclusion

The importance of wellbeing, and the hidden weaknesses of income, make it important that we consider wellbeing as well as income and health inequalities when we are appraising the fairness of a society. Nonetheless, it is not an easy thing to do.

In this short paper we have presented four different metrics that could be used to assess wellbeing inequality, and have made an initial foray into calculating them at regional level for the UK. We have found that the rankings produced by three of these metrics are highly correlated within our limited set of observations, and that a fourth, the ratio of Low to Very High wellbeing scores in a region, is less strongly correlated with the others.

The purpose of this paper is to spur discussion about how best we might measure inequalities in wellbeing in a way that reflects the lived experience of people in society, and which allows apples-to-apples comparisons to be made across groups of people and across time. We welcome any comments or thoughts that emerge from this paper and you can get in touch at [info@whatworkswellbeing.org](mailto:info@whatworkswellbeing.org). We will be continuing the development of measures of wellbeing inequalities in the months to come.

## Related resources

Explore our [how to guide on measuring wellbeing inequalities](#).