Personal well-being quarterly estimates technical report

Description of the statistical methods and techniques used to create and analyse quarterly estimates for personal well-being in the UK. This is the first time that we are publishing quarterly data for the personal well-being figures as Experimental Statistics, providing a more timely picture comparable with economic well-being statistics.

Notice

27 November 2023

We are currently reviewing the personal well-being guidance and will update this page by spring 2024.

Table of contents

1 . Introduction

This technical report accompanies the [Personal and economic well-being in the UK: November 2019](#) statistical bulletin. Quarterly personal well-being figures have been published for the first time in this bulletin as Experimental Statistics using data from the Annual Population Survey (APS) for the period from Quarter 2 (Apr to June) 2011 to Quarter 2 2019.

Using the quarterly data allows us to explore short-term changes in personal well-being by looking at fluctuation over the years and comparisons of quarters one year apart. Additionally, using quarterly estimates has the benefit of being more comparable with the economic well-being estimates, which also use quarterly data for its indicators.

This technical report outlines:

- comparisons between the annual personal well-being estimates and the newly created quarterly estimates

- an in-depth analysis of the new quarterly personal well-being estimates

- seasonal decomposition of the new quarterly personal well-being data

2 . Annual personal well-being estimates

The analysis of personal well-being in this report is from the Annual Population Survey (APS). The APS is a continuous household survey covering the UK, providing estimates between censuses of important social and labour market variables at a local area level. The APS datasets are weighted to reflect the size and composition of the general population, by using the most up-to-date official population data. Weighting factors take account of the design of the survey (which does not include communal establishments) and the composition of the local population by age and sex. The annual personal well-being figures have been used in previous personal and economic well-being releases. More information on the APS is available in the personal well-being in the UK quality and methodology information.

Looking at the annual estimates, there was little change in ratings of personal well-being between the year ending June 2015 and June 2019. For life satisfaction, the feeling that the things done in life are worthwhile and happiness, average ratings remained level with no significant changes over the period year ending June 2018 to year ending June 2019 (Figure 1).

Figure 1: Average ratings of life satisfaction, feeling that the things done in life are worthwhile and happiness have shown little change in the last year

Average ratings of life satisfaction, feeling that the things done in life are worthwhile and happiness, UK, years ending June 2012 to June 2019

Figure 1: Average ratings of life satisfaction, feeling that the things done in life are worthwhile and happiness have shown little change in the last year

Average ratings of life satisfaction, feeling that the things done in life are worthwhile and happiness, UK, years ending June 2012 to June 2019
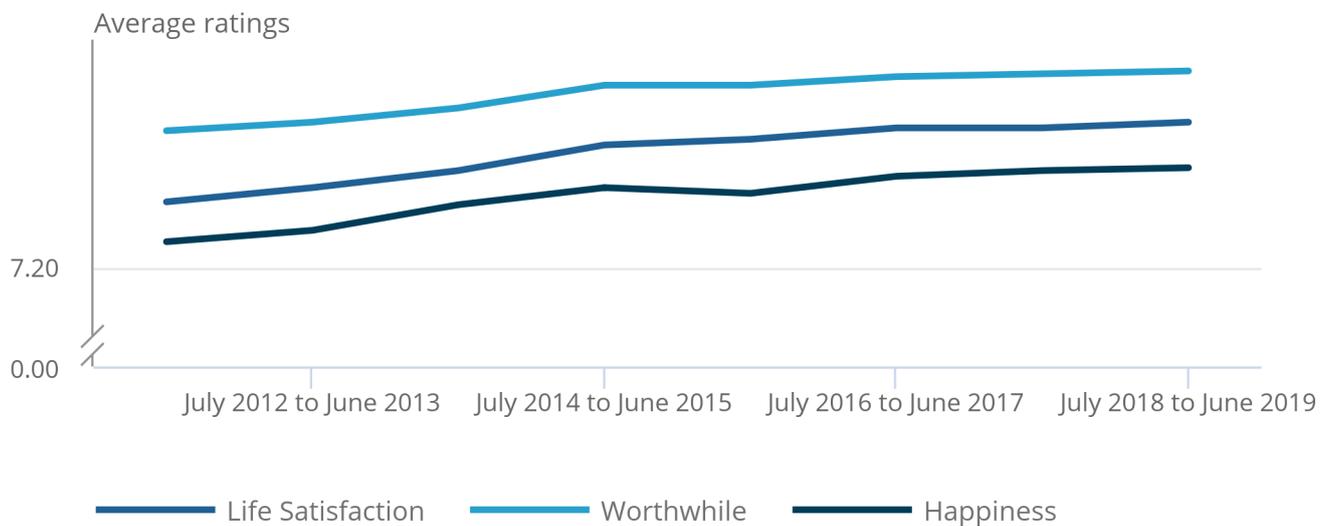
Source: Office for National Statistics - Annual Population Survey
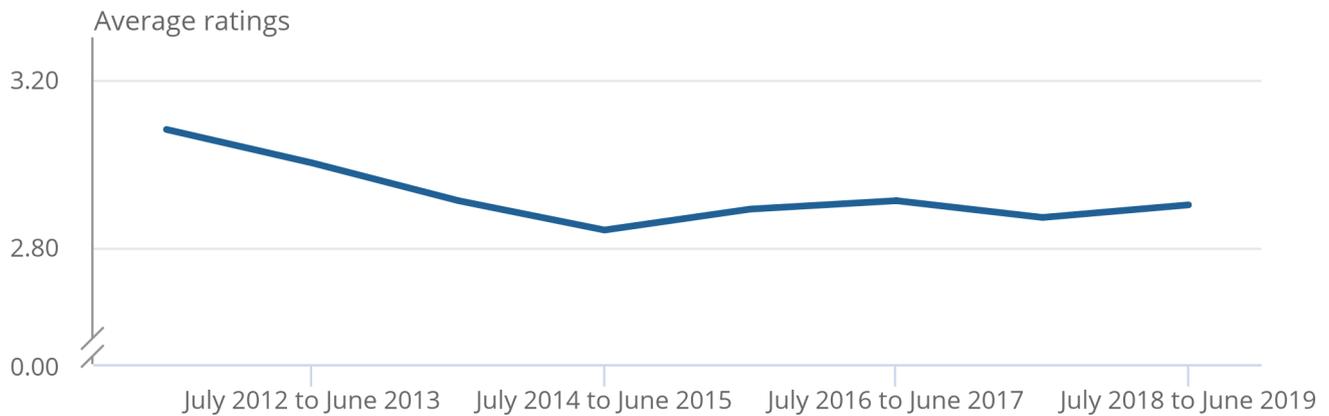
Notes:

1. Chart axis has a break in it.

Figure 2: Average anxiety ratings have seen no significant change in the last year

Average anxiety ratings, UK, years ending June 2012 to June 2019

Figure 2: Average anxiety ratings have seen no significant change in the last year

Average anxiety ratings, UK, years ending June 2012 to June 2019

Average ratings

| | July 2012 to June 2013 | July 2014 to June 2015 | July 2016 to June 2017 | July 2018 to June 2019 |

Source: Office for National Statistics - Annual Population Survey

Notes:

1. Chart axis has break in it.

In addition to looking at average ratings, we also monitor potential inequalities in personal well-being by comparing those rating each aspect of their well-being either at a very high level or a very low level. Between the years ending June 2018 and June 2019, there was no significant change in the proportions of people reporting "low" or "very high" life satisfaction, feeling that things done in life are worthwhile, and happiness. There was also no significant change in the proportions of people reporting "high" or "very low" anxiety over the same period.

3 . Quarterly personal well-being estimates

As there was little change in the annual data recently, we explored the use of quarterly data in order to understand possible variation across the quarters in personal well-being. Quarterly data were generated from the Annual Population Survey (APS) by dividing the annual dataset into four quarterly datasets. Each quarterly dataset was then weighted to reflect the size and composition of the general population, by using the most up-to-date official population data.

Weighting factors considered the design of the survey (which does not include communal establishments) and the composition of the local population by geography, age and sex. The weighting was done by calibration to population totals of groups defined by two different partitions. The first partition was defined by region, age (grouped) and sex, and the second by local authority. This ensured that the weighted quarterly sample had the same distribution as the general population with respect to each partition.

Initial analysis was performed on the unadjusted personal well-being data to look at the average percentage change between quarters in order to identify any emerging patterns. This analysis aimed to better understand any systematic variation present in the data, to indicate whether seasonal decomposition would be a relevant tool to use. The analysis showed that anxiety and happiness presented the greatest seasonal variation throughout the year, while life satisfaction and feeling that things done in life are worthwhile were more stable measures.

The analysis that follows shows a systematic calendar-related variation associated with the time of the year. Therefore, a seasonal adjustment was applied to establish the general pattern of the data, the long-term movements and whether any unusual occurrences had major effects on the series.

Figure 3: Average anxiety ratings deteriorated between Quarter 3 and Quarter 4, but improved between all other quarters

Average percentage change between quarters for anxiety, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 3: Average anxiety ratings deteriorated between Quarter 3 and Quarter 4, but improved between all other quarters

Average percentage change between quarters for anxiety, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019
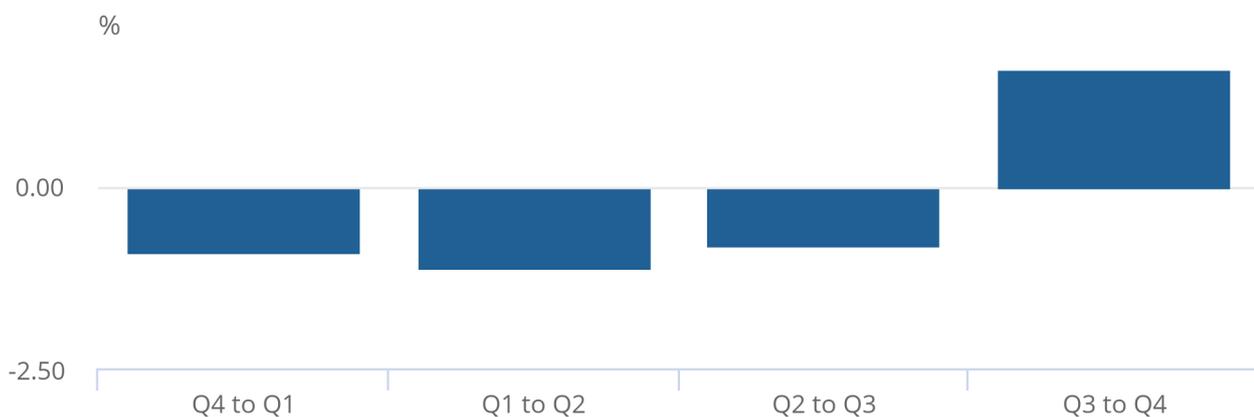
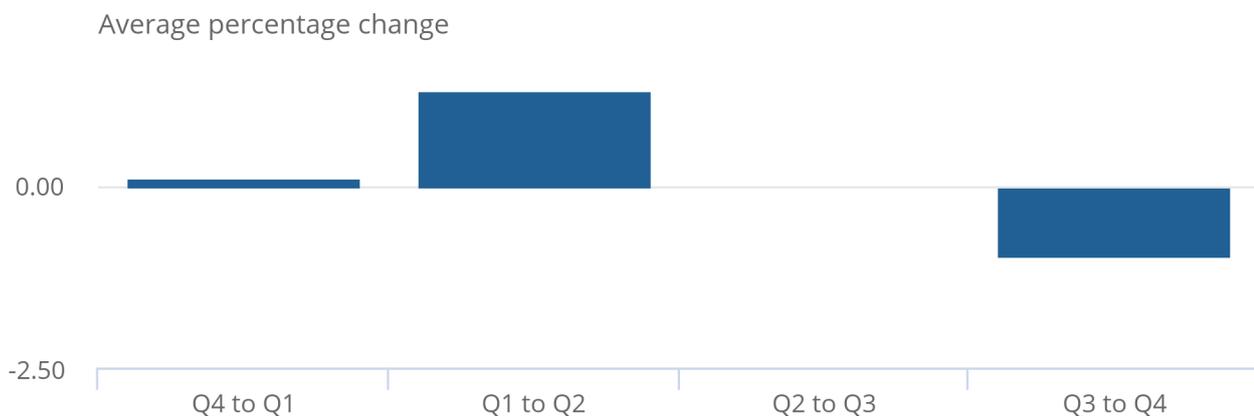**Source: Office for National Statistics - Annual Population Survey**

Between Quarter 2 (Apr to June) 2011 and Quarter 2 2019, the changes between Quarter 1 (Jan to Mar) and Quarter 2 regularly showed the most improvement in anxiety ratings, with an average decrease of 1.1%. Quarter 4 (Oct to Dec) to Quarter 1 and Quarter 2 to Quarter 3 (July to Sept) also showed regular improvements in anxiety ratings, with a decrease of 0.9% and 0.8% respectively. The only quarterly change to consistently show a worsening of anxiety ratings was between Quarter 3 and Quarter 4, with an average deterioration of 1.6%.

Figure 4: Average happiness ratings improved between Quarter 1 and Quarter 2 and deteriorated between Quarter 3 and Quarter 4

Average percentage change between quarters for happiness, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 4: Average happiness ratings improved between Quarter 1 and Quarter 2 and deteriorated between Quarter 3 and Quarter 4

Average percentage change between quarters for happiness, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

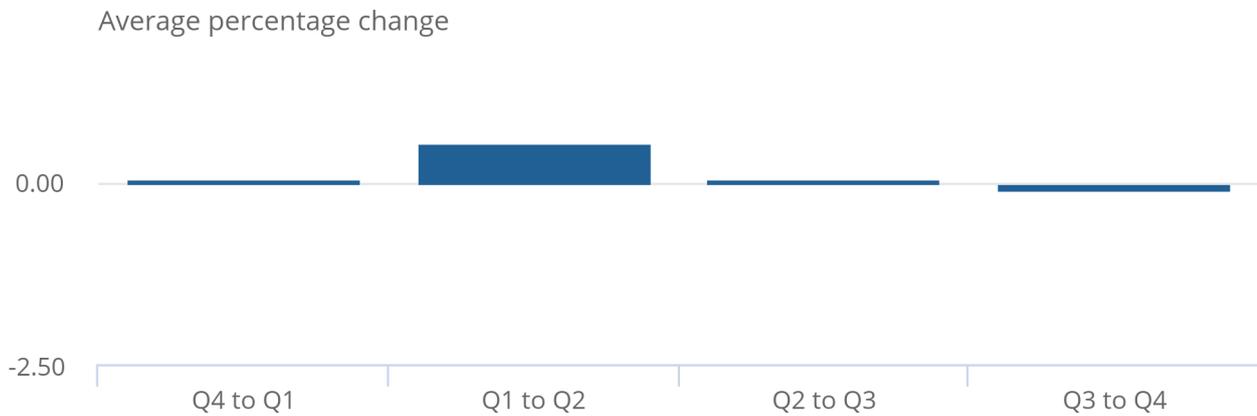**Source: Office for National Statistics - Annual Population Survey**

The average change in happiness ratings between Quarter 2 2011 and Quarter 2 2019 was most pronounced between Quarter 1 and Quarter 2, with an average increase of 1.3%. There was an average increase of 0.1% between Quarter 4 and Quarter 1 while there was no change between Quarter 2 and Quarter 3. However, regular negative changes in happiness occurred between Quarter 3 and Quarter 4, with an average decrease of 1.0%.

Figure 5: Average life satisfaction ratings showed a slight improvement between Quarter 1 and Quarter 2

Average percentage change between quarters for life satisfaction, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 5: Average life satisfaction ratings showed a slight improvement between Quarter 1 and Quarter 2

Average percentage change between quarters for life satisfaction, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Average percentage change

0.00			
-2.50			
Q4 to Q1	Q1 to Q2	Q2 to Q3	Q3 to Q4

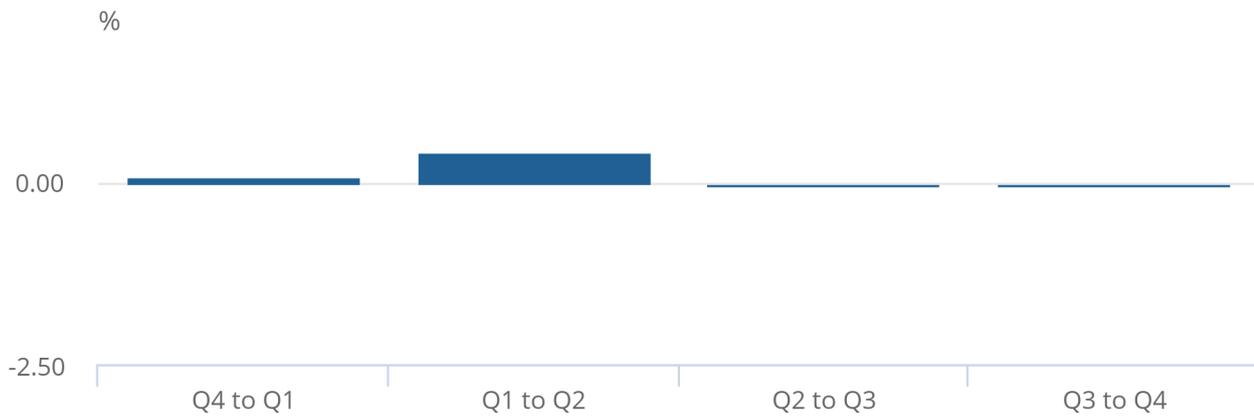**Source: Office for National Statistics - Annual Population Survey**

Between Quarter 2 2011 and Quarter 2 2019, there was an average increase of 0.6% for life satisfaction between Quarter 1 and Quarter 2. There was no average change between Quarter 4 and Quarter 1 and Quarter 2 and Quarter 3. The only quarterly period that regularly showed a negative percentage change in life satisfaction was between Quarter 3 and Quarter 4, with an average decrease of 0.1%.

Figure 6: Average worthwhile ratings showed a slight improvement between Quarter 1 and Quarter 2

Average percentage change between quarters for worthwhile, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 6: Average worthwhile ratings showed a slight improvement between Quarter 1 and Quarter 2

Average percentage change between quarters for worthwhile, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Source: Office for National Statistics - Annual Population Survey

Between Quarter 2 2011 and Quarter 2 2019, there was an average increase of 0.4% for worthwhile between Quarter 1 and Quarter 2. The only other quarterly period to report a positive average change was between Quarter 4 and Quarter 1 with a 0.1% increase. Quarter 2 to Quarter 3 and Quarter 3 to Quarter 4 showed no change over the period.

4 . Seasonal decomposition of quarterly personal well-being data

Seasonal adjustment removes the estimated variations as a result of the time of year and calendar arrangement, so that other underlying trends can be easier to observe in the data. However, in the context of personal well-being, seasonal variation is also of interest, as it concerns the effect the time of year has on public opinion. Therefore, the analysis and interpretation of the non-seasonally adjusted data (Section 3) should not be considered less important than the seasonally adjusted estimates.

The personal well-being time series were tested for seasonality and seasonally adjusted using X13-ARIMA-SEATS software where necessary. The seasonal adjustment was performed using the X11 algorithm, which is a non-parametric approach based on iterations of moving average filters. As part of the standard procedure, the series were tested for additive outliers (extreme one-off points that are not in line with the rest of the series), level shifts (a sustained change in the trend level), and Easter effects (considered specifically because Easter is a calendar-related event that can move between quarters).

If any of these effects were considered to be statistically significant, the series was prior-adjusted using a regARIMA model to correct the series before applying the moving average filters for the seasonal adjustment. More information can be found in the Seasonal adjustment methodological note.

Three series were identified as having an Easter effect and all three were part of the happiness sub-group. The effect was negative for the mean and high happiness threshold, and positive for the low happiness threshold series. The implication is that happiness seems to decrease in the period immediately before Easter. Most of the series were not identified to have outliers or level shifts, even if some values appeared visually extreme.

Average happiness was identified as having an unusually low value (a negative outlier) for Quarter 2 (Apr to June) 2016, average anxiety had a negative outlier for Quarter 3 (July to Sept) 2013 and the medium threshold for happiness had a positive outlier for Quarter 2 2012. At present, the series are relatively short so seasonality status, identified outliers and Easter effects may change when more data points are added. Specifically, the series which were identified as non-seasonal may become seasonal. Also, the estimation of the Easter effect will become more accurate when there are more instances of Easter in the series, so any interpretations should be only tentative at this stage. A regular annual review of the seasonal adjustment parameters will be performed to ensure any changes are applied where necessary.

Table 1 lists those variables that have and have not been seasonally adjusted. It was decided that:

- the mean life satisfaction, "medium" and very high" thresholds exhibited seasonality so have been seasonally adjusted but not the "low" and "high" life satisfaction thresholds

- the mean worthwhile time series and "very high" worthwhile thresholds exhibited seasonality so have been seasonally adjusted, but the thresholds "low", "medium" and "high" worthwhile thresholds have not

- both the means and thresholds for happiness have been found to be seasonal and have been seasonally adjusted

- the anxiety thresholds "very low" and "high" have been found to have seasonality, but "low" and "medium" thresholds have not exhibited seasonality so have not been seasonally adjusted

Table 1: Seasonal adjustment of personal well-being quarterly well-being data

| Personal well-being measures and indicators	Seasonally Adjusted
Life satisfaction - mean	Yes
Life satisfaction – "low" (0 to 4)	No
Life satisfaction – "medium" (5 to 6)	Yes
Life satisfaction – "high" (7 to 8)	No
Life satisfaction – "very high" (9-10)	Yes
Worthwhile – mean	Yes
Worthwhile – "low" (0 to 4)	No
Worthwhile – "medium" (5 to 6)	No
Worthwhile – "high"' (7to 8)	No
Worthwhile – "very high" (9 to 10)	Yes
Happiness – mean	Yes
Happiness – "low" (0 to 4)	Yes
Happiness – "medium" (5 to 6)	Yes
Happiness – "high" (7 to 8)	Yes
Happiness – "very high" (9 to 10)	Yes
Anxiety – mean	Yes
Anxiety – "very low"' (0 to 1)	Yes
Anxiety – "low" (2 to 3)	No
Anxiety – "medium" (4 to 5)	No
Anxiety – "high" (6 to 10)	Yes

Source: Office for National Statistics

Figures 7 to 10 show the seasonally adjusted average figures and the quarterly unadjusted average figures for the four personal well-being indicators on the same chart, in order to highlight the impact that seasonal adjustment has had on the data providing a better indication of the underlying movements. In the charts, the biggest differences between the seasonally adjusted and unadjusted time series occurs for the average happiness and anxiety ratings. This is because these variables exhibit the greatest seasonality, which is consistent with the analysis in Section 3.

Figure 7: Average ratings for life satisfaction showed little seasonality

Seasonally decomposed average life satisfaction compared with unadjusted average life satisfaction, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 7: Average ratings for life satisfaction showed little seasonality

Seasonally decomposed average life satisfaction compared with unadjusted average life satisfaction, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019
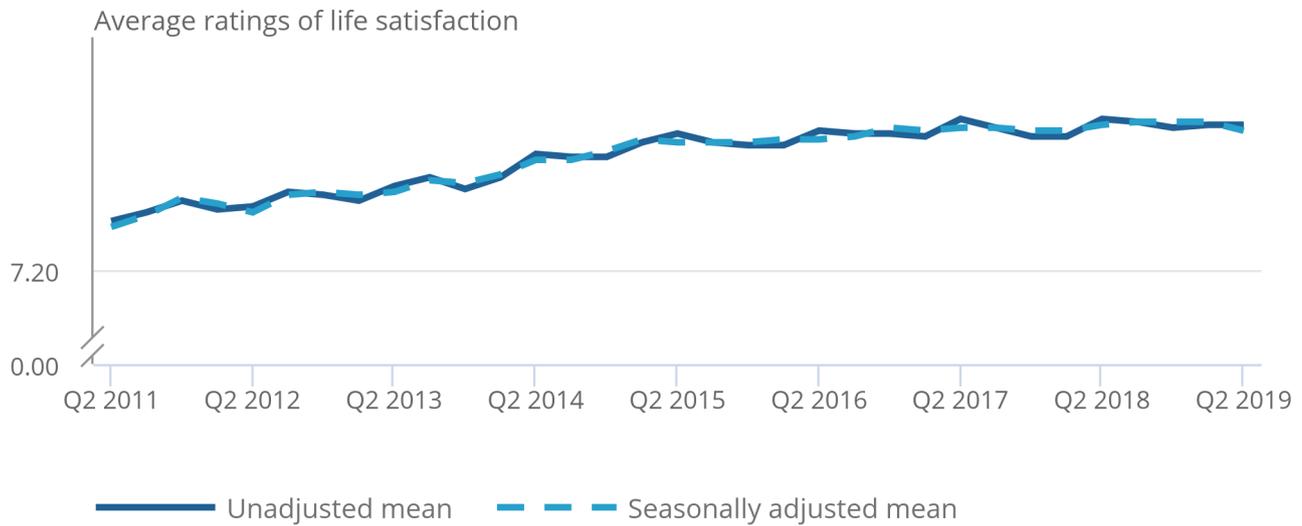
Source: Office for National Statistics - Annual Population Survey
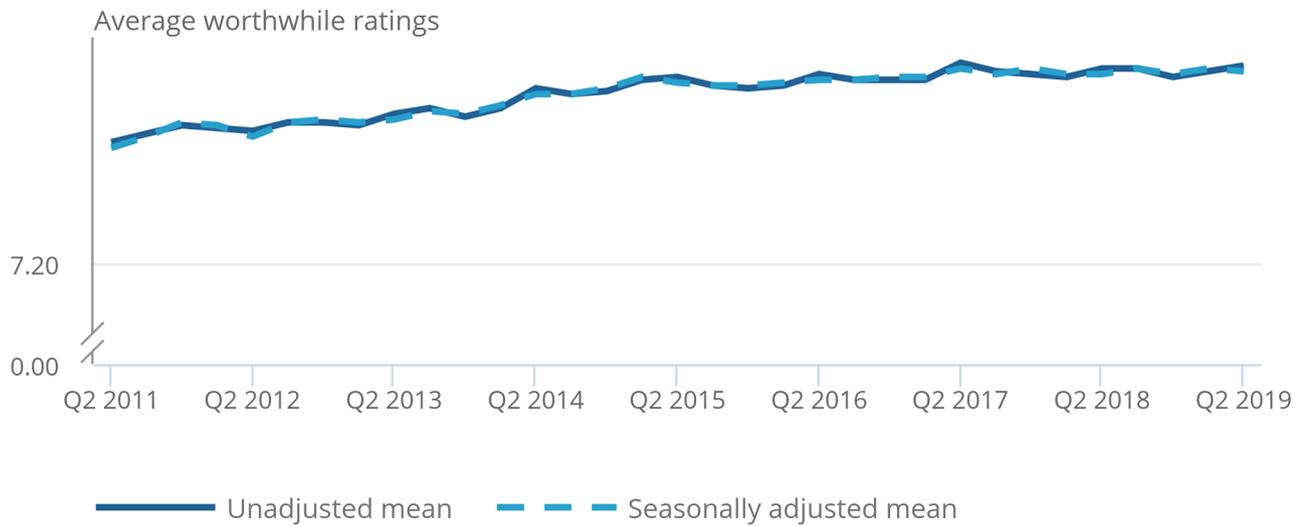
Notes:

1. Chart axis has a break in it.

Figure 8: Average ratings for worthwhile showed little seasonality

Seasonally decomposed average worthwhile ratings compared with unadjusted average worthwhile ratings, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 8: Average ratings for worthwhile showed little seasonality

Seasonally decomposed average worthwhile ratings compared with unadjusted average worthwhile ratings, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

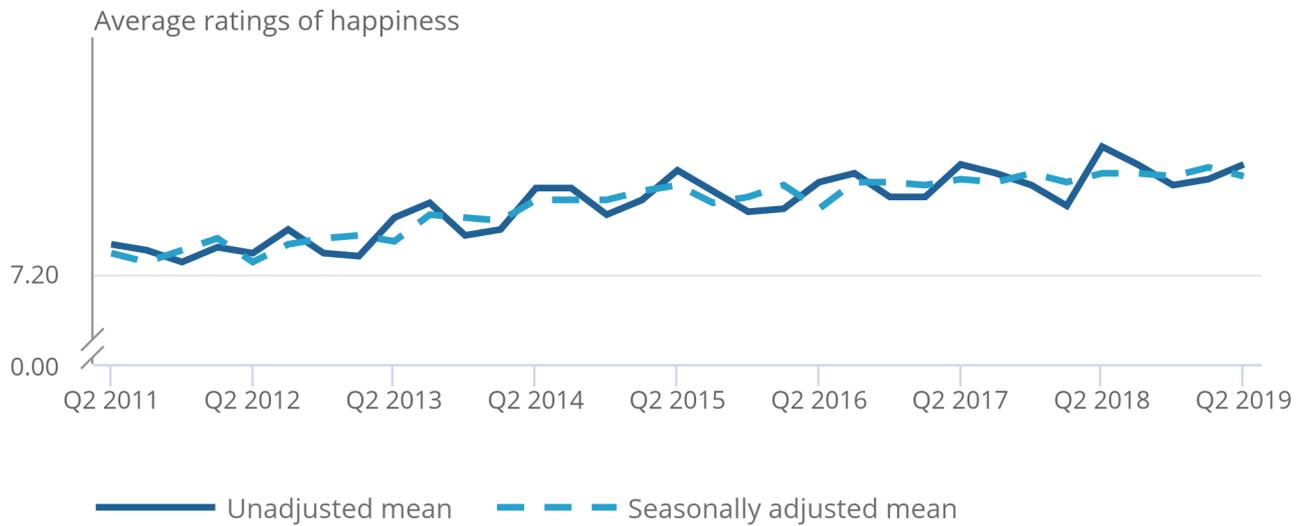**Source: Office for National Statistics - Annual Population Survey**

Notes:

1. Chart axis has a break in it.

Figure 9: Average ratings for happiness showed the most seasonality

Seasonally decomposed average happiness ratings compared with unadjusted average happiness ratings, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Figure 9: Average ratings for happiness showed the most seasonality

Seasonally decomposed average happiness ratings compared with unadjusted average happiness ratings, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Average ratings of happiness

7.20

0.00

Q2 2011 Q2 2012 Q2 2013 Q2 2014 Q2 2015 Q2 2016 Q2 2017 Q2 2018 Q2 2019

—— Unadjusted mean – – – Seasonally adjusted mean

Source: Office for National Statistics - Annual Population Survey
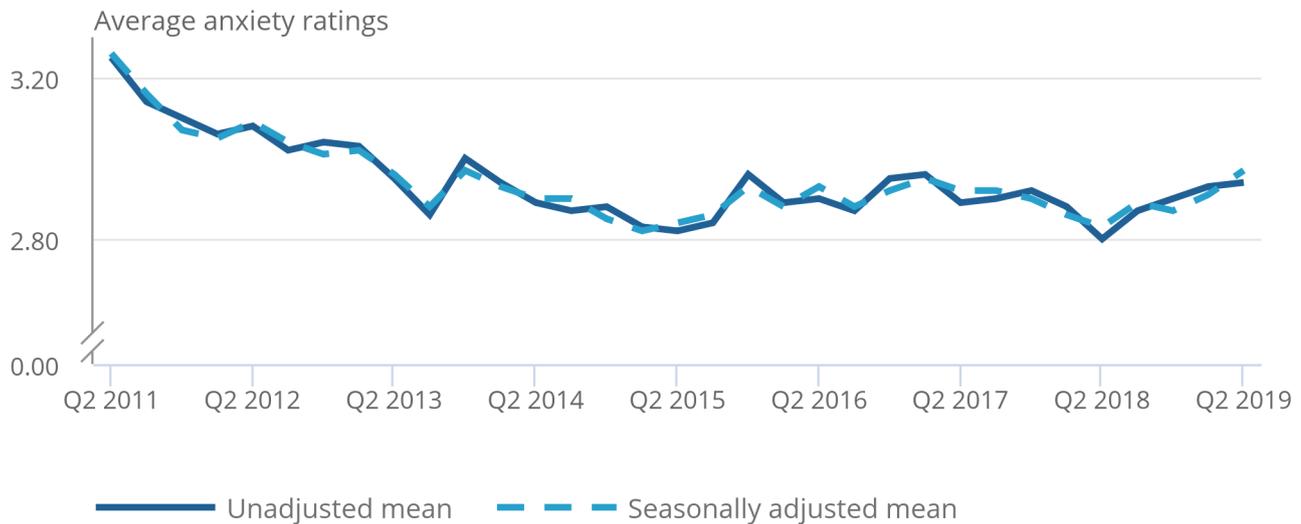
Notes:

1. Chart axis has a break in it.

Figure 10: Average ratings for anxiety showed some seasonality

Seasonally decomposed average anxiety ratings compared with unadjusted average anxiety ratings, UK, Quarter 2 (Apr to June) 2011 to Quarter 2 2019

Source: Office for National Statistics - Annual Population Survey

Notes:

1. Chart axis has a break in it.

5 . Related links

Personal and economic well-being in the UK: November 2019

Bulletin | Released on 14 November 2019

Estimates looking across personal well-being and economic well-being in the UK for Quarter 2 (Apr to June) 2019. This is the first time that we are publishing quarterly data for the personal well-being figures as Experimental Statistics, providing a more timely picture comparable with economic well-being statistics. This bulletin is part of a new series on people and prosperity introduced in February 2019.