QIMacros®

KnowWare International, Inc.

2025

Fat Content Variation
Case Study

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Introduction

What is the variation of fat content found at a local bar and restaurant?

In this case study, we focus on Pareto's Big Bar, which is a bar and restaurant that serves hamburgers, amongst several other items.

Pareto's Big Bar reports that the average fat content found in one of their hamburgers is 15 grams.

Objectives

Recently, several customers provided feedback in which they believed the fat content was higher than 15 grams.

Pareto's Big Bar's Operations Manager has requested we use 95% Confidence Intervals to provide the average fat content found in their hamburgers, and whether 15 grams of fat is indeed still correct.

Data Provided

The Operations Manager provided 20 randomly selected hamburgers and measured the fat content for each. Below is the data provided:

15.5, 12.3, 15.4, 16.5, 15.9, 17.1, 16.9, 14.3, 19.1, 18.2, 18.5, 16.3, 20.0, 19.0, 15.6, 13.5, 14.0, 16.5, 19.0, and 18.6.

Open the "QI Macros - Confidence Interval Case Study - Fat Content Variation.xlsx" file.

The first step is to check that the data provided by Pareto's Big Bar's Operations Manager is in control. And since the data is a single-column set of Variable (decimal) data, it is best practice to create an XmR Individuals Chart which will provide Stability Analysis.

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Measurement Analysis (Control Chart)

To create an XmR Individuals Chart using QI Macros, select the "Fat Before (gms)" data in column A:

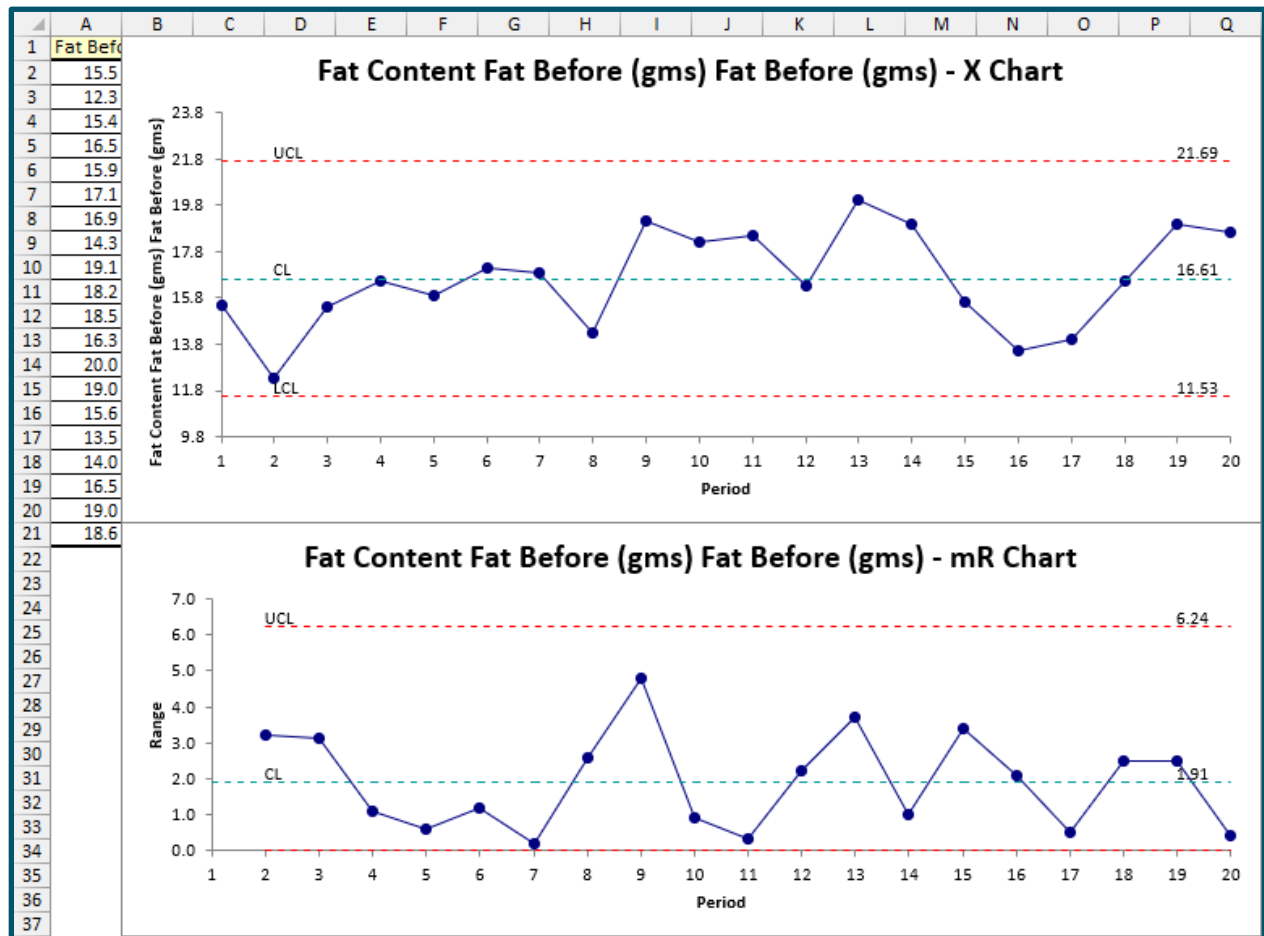|	A
1	Fat Before (gms)
2	15.5
3	12.3
4	15.4
5	16.5
6	15.9
7	17.1
8	16.9
9	14.3
10	19.1
11	18.2
12	18.5
13	16.3
14	20
15	19
16	15.6
17	13.5
18	14
19	16.5
20	19
21	18.6

Next, create an XmR Chart by selecting **QI Macros > Control Charts (SPC) > Variable (XmR, XbarR/S) > XmR-ImR Individuals**:

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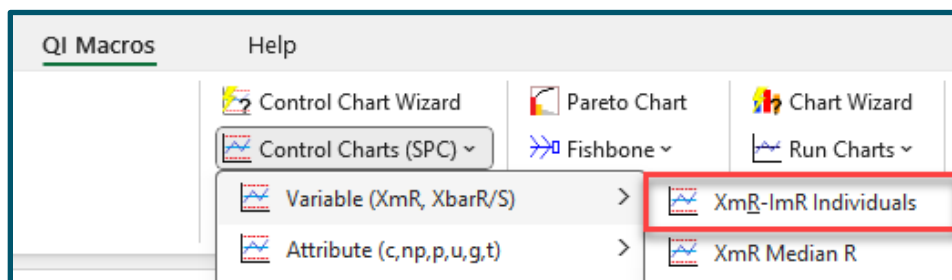
A "Before Improvement" XmR Chart will then be created:

And as the charts indicate, the data provided proves to be in-control, with no Control Chart Rules violations. However, the average fat content is calculated as 16.61 grams.

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Measurement Analysis (Descriptive Statistics)

And since the Control Chart analysis shows the data is in control, we can now proceed to the Descriptive Statistics portion of the study.

By utilizing the "Descriptive Statistics" tool found in QI Macros, the analysis will confirm whether or not the data is normally distributed.

To do so, highlight the "Fat Before (gms)" data again in column A.

Next, run Descriptive Statistics by selecting **QI Macros > Descriptive Statistics - Normality Test**:

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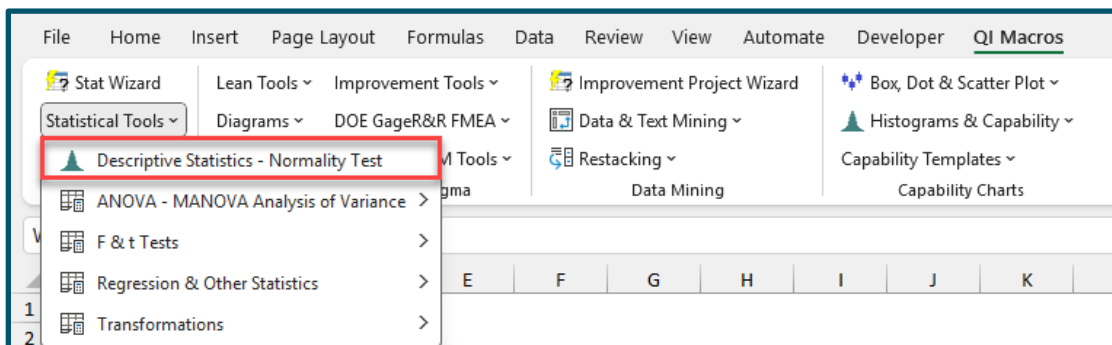
"Before Improvement" Descriptive Statistics will be created:
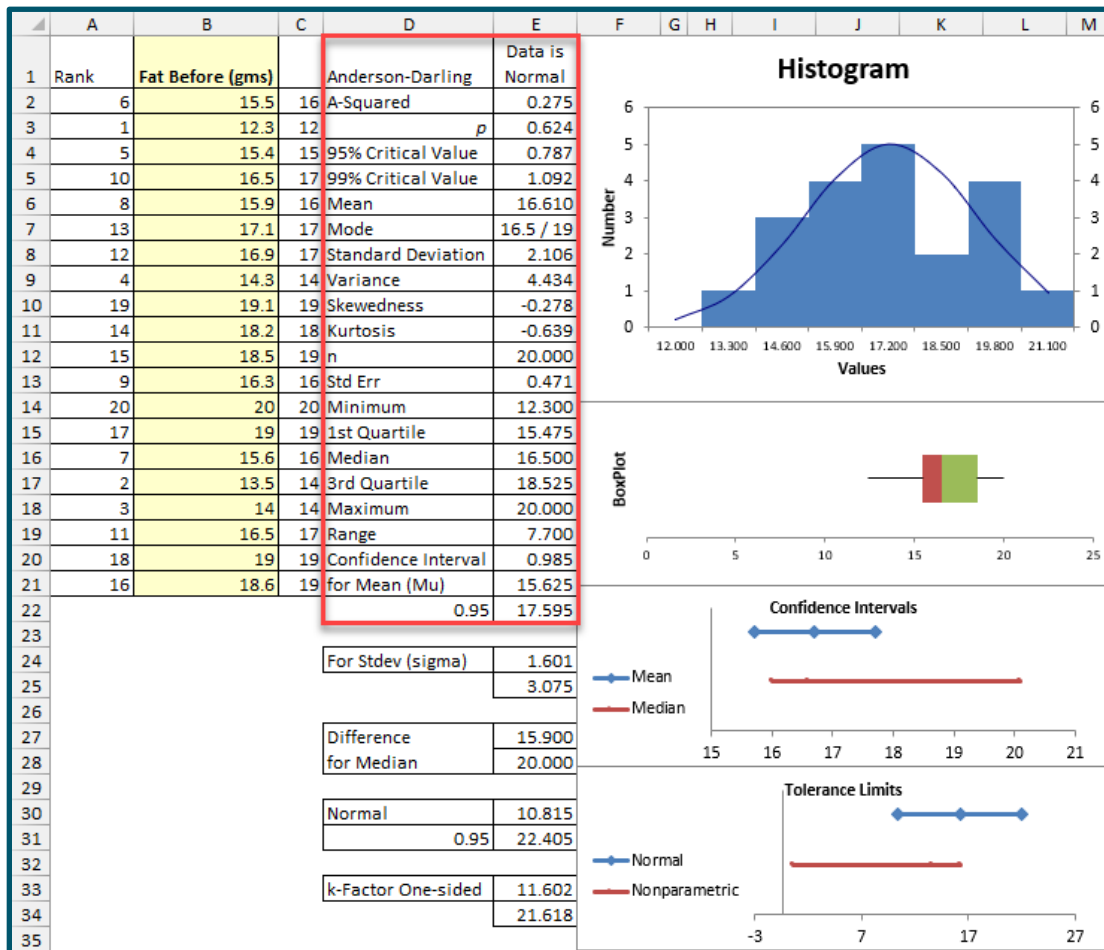
The Descriptive Statistics results show that because the P-value of the Anderson Darling Normality Test is 0.624 (greater than 0.05), the data is normally distributed.

Also, the Confidence Interval for Mean (Mu) is between 15.625 and 17.595, which is greater than the restaurant's 15 grams of fat per burger claim.

Because of this finding, the Operations Manager should consider this a serious issue with regards to fat content.

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Examination Results

After the results showed the hamburger fat content was more than 15 grams per, the Operations Manager performed further inspections.

They found that this was due to the varying amount of oil used by Pareto's Big Bar employees on 3 separate grills that are being used to cook the hamburgers.

How to Improve?

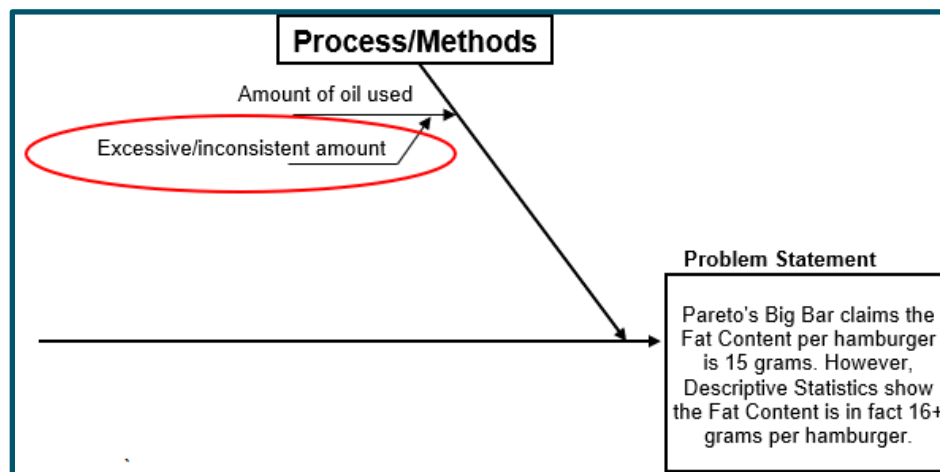The next step was for the Operations Manager to find a way to decrease the fat content of the cooked hamburgers. While one option could be to regulate the use of oil used on the grills mentioned in "Examination Results," Pareto's Big Bar decided to try a different approach.

At the time, the restaurant used 85 % lean / 15 % fat hamburger patties. This in combination with the inconsistent use of oil was leading to the fat content issue.

The Operations Manager then decided to switch from 85/15 patties to 80/20 patties. They also decided to no longer use oil when cooking their hamburgers on the 3 flat top grills.

New data was then collected to check whether the change in % lean/% fat patties, in combination with cutting out oil improved their fat content – see data below:

14.9, 15.0, 15.4, 15.3, 15.2, 15.1, 14.9, 14.8, 15.6, 14.5, 15.3, 15.8, 15.0, 15.0, 14.3, 15.3, 15.2, 14.7, 15.1, and 14.7.

Before and After Control Chart Reporting

Creating a Before and After XmR Control Chart will show if the newly implemented changes have improved the restaurant's overall cooking process.

To do so, place the Before and After data into a single column, separated with a blank row and highlight the data:

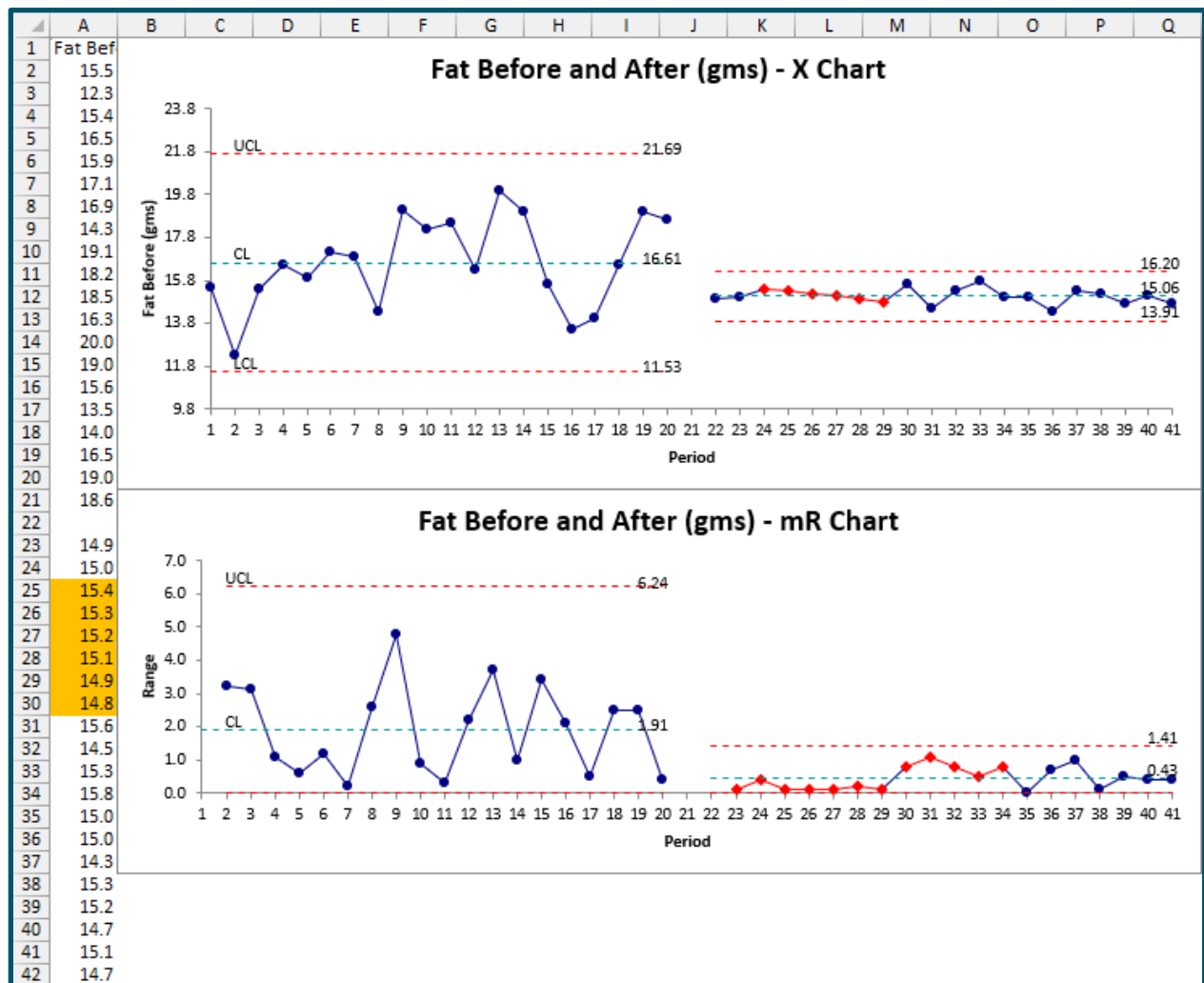|	A
1	Fat Before (gms)
2	15.5
3	12.3
4	15.4
5	16.5
6	15.9
7	17.1
8	16.9
9	14.3
10	19.1
11	18.2
12	18.5
13	16.3
14	20
15	19
16	15.6
17	13.5
18	14
19	16.5
20	19
21	18.6
22	
23	14.9
24	15
25	15.4
26	15.3
27	15.2

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Next, create an XmR Chart by selecting **QI Macros > Control Charts (SPC) > Variable (XmR, XbarR/S) > XmR-ImR Individuals**.

A "Before and After Improvement" XmR Chart will then be created!

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Fat Bef																
2	15.5																
3	12.3																
4	15.4																
5	16.5																
6	15.9																
7	17.1																
8	16.9																
9	14.3																
10	19.1																
11	18.2																
12	18.5																
13	16.3																
14	20.0																
15	19.0																
16	15.6																
17	13.5																
18	14.0																
19	16.5																
20	19.0																
21	18.6																
22																	
23	14.9																
24	15.0																
25	15.4																
26	15.3																
27	15.2																
28	15.1																
29	14.9																
30	14.8																
31	15.6																
32	14.5																
33	15.3																
34	15.8																
35	15.0																
36	15.0																
37	14.3																
38	15.3																
39	15.2																
40	14.7																
41	15.1																
42	14.7																

Fat Before and After (gms) - X Chart

UCL — 21.69
CL — 16.61
16.20
15.06
13.91
LCL — 11.53

Fat Before and After (gms) - mR Chart

UCL — 6.24
CL — 1.91
1.41
0.43

And as the chart indicate, the new data provided proves to be in-control, with minimal Control Chart Rules violations on the X (Average) Chart. Also, the calculated Average fat content is now 15.06.

NEW Measurement Analysis (Descriptive Statistics)

Since the Control Chart analysis shows the data is in control, we can now proceed to the Descriptive Statistics portion of the study.

Highlight the "Fat After (gms)" data and run Descriptive Statisticss.

"After Improvement" Descriptive Statistics will then be created:
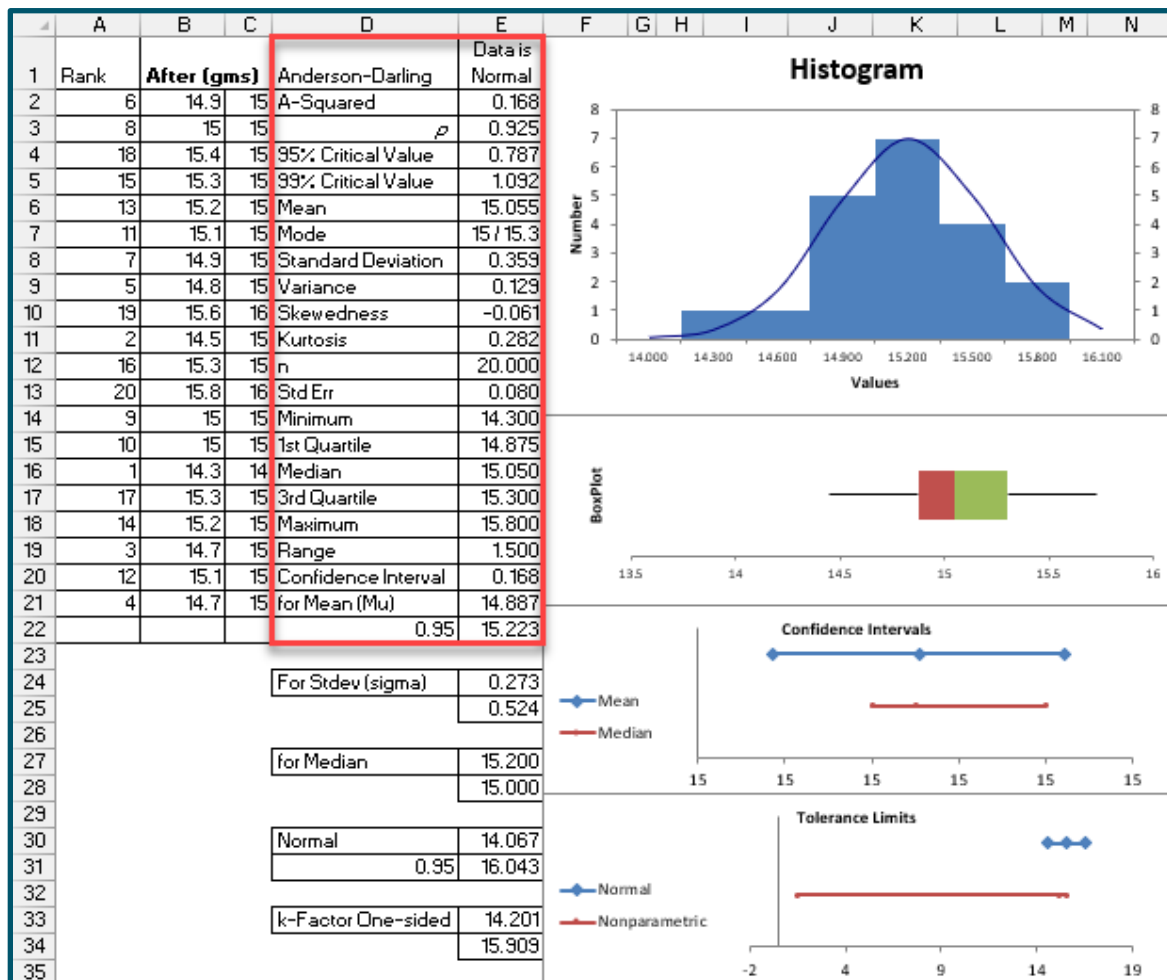
The Descriptive Statistics results show that because the P-value of the Anderson Darling Normality Test is 0.925 (greater than 0.05), the data is normally distributed.

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Also, the Confidence Interval for Mean (Mu) is between 14.887 and 15.223. This shows that the newly implemented changes improved the restaurant's overall cooking process.

Because of this finding, the Operations Manager can now sufficiently claim that the fat content of 15 grams per hamburger is accurate.

Future Reporting

Moving forward, Pareto's Big Bar's Operations Manager will regularly check the fat content of the prepared hamburgers, using the same approach listed in this case study.

This will allow Pareto's Big Bar to confidently claim the fat content of 15 grams per hamburger continues to be accurate.

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