Summary report on the analysis of nutrients in beef cuts and lamb leg, 2026

1. Notes on specific nutrients

Based on personal experience, in different studies of the same food it is common to find much larger differences for micronutrients (e.g. vitamins, selenium) than for proximate and macro nutrients (e.g. protein, magnesium). From the relatively small amount of data I am aware of on variation in micronutrient levels, it leads me to believe that only large differences (maybe above 50 to 100%) are worth examining further for micronutrients.

Proximates (moisture, protein, fat, ash). Methods of analysis have not changed substantially for these components since Williams et al, so data should be directly comparable.

The sum of proximates is a measure of how effectively these components have been measured. All our samples had an acceptable SOP (97-103 g/100 g).

I calculated energy using the same factors that FSANZ use for AFCD3 and for nutrition labelling – protein x 17 kJ/gram and fat by 37 kJ/gram.

Niacin – This is one of the nutrients with relatively big differences compared to AFCD3. Mostly the new values are about the same or higher than in AFCD for preformed niacin. This study used a different method to that used by Williams et al (*subject to NMI confirmation*). The method difference is likely to be part of the reason why results may vary compared to older data. At the levels found in this study for the lean portion, measurement uncertainty is reported by NMI as 5 ± 1.1 mg/100g, and in a study by FSANZ in 2006 of chicken breast, grilled, the niacin value of 17.1 mg/100 g had a range among 10 samples analysed by the same method from 14.0-21.0 mg/100 g. In the same study, baked chicken drumsticks had an average of 9.4 and range of 6.2-12.0 mg/100 g.

Niacin in foods is usually reported as preformed niacin (as measured in this study) and niacin that can be formed in the body from consuming the amino acid tryptophan. Therefore the values for niacin equivalents will reflect two measurements and, potentially, reflect changes in methods of analysis over time.

The calculation of niacin derived from tryptophan is calculated by dividing the mass of tryptophan per 100 g (note that it is reported per kilogram in our data) by 60. This value is then added to the preformed niacin to yield a value for niacin equivalents.

Vitamin B12. This nutrient has a smaller set of data for AFCD3 to draw on as it is a relatively "new" nutrient in terms of food analysis. The method used in this study is different to that used by Williams et al.

Fatty acids. In this study, saturated fat levels are higher and long chain omega-3 fatty acid levels are lower than in AFCD3. As discussed with NMI, uncertainty in measuring individual fatty acids is quite high (plus or minus 25%) so total values may reflect a compounding of uncertainty. For the long chain omega 3s (EPA and DHA), the levels are so low that they are just above the limit of reporting so are likely to have uncertainty above 25%. Nevertheless, overall we see a similar pattern in fatty acid composition to past data, with saturates representing about

half of all fatty acids, a slightly lower level of monounsaturates and low levels of polyunsaturates.

NMI had reported total values for saturates, monounsaturates and polyunsaturates. I recalculated the latter two using all the individual fatty acid data provided, assigning all values reported as <0.1 a value of 0, which is the approach FSANZ uses for AFCD3. For trans fatty acids, I summed the two values provided by NMI, to generate a total trans fatty acid value. I added a column that sums the mass of saturates plus trans, to assist with any claims that require saturates and trans to be below a certain level. The formula for calculating mass of fatty acids is given below.

It was challenging to estimate levels of EPA+DPA due to many values being reported as <0.1% of total fatty acids. In order to do this, I assigned any value for these two acids that was reported as <0.1, a value of 0.05 (half the LOR). Obviously, this results in estimates with a large amount of uncertainty.

Your specific questions about fatty acids are answered later on.

Amino acids. FSANZ holds very little amino acid data, other than for tryptophan which is often measured due to its contribution to niacin. I didn't identify any notable differences in amino acids between samples, except that glutamate and methionine tended to be higher in grass fed meat. However the measurement uncertainty for amino acids is plus minus 20%. In this study, amino acid levels are reported as mg/100 g food, and so levels are affected by the overall protein content (more protein should lead to more amino acids) as well as any sample differences. FSANZ also reports values as mg/gram nitrogen. I haven't calculated this as I don't think you'll need this information.

Minerals. NMI report minerals per kilogram, whereas food composition tables and labelling require values per 100 g. Therefore I have inserted data for values per 100 g and converted selenium values to micrograms rather than milligrams.

2. Grass vs grain

Overall, there appears to be little difference between the meat of animals fed only on grass and those who were finished on grain. As noted earlier, there are some minor differences in some amino acids. Also, there seems to be a trend for higher LCPUFA in grass fed, but the values are so low, with such high uncertainty, that I don't think any conclusions can be drawn from it.

Because the values are so similar between the feeding regimes, I don't see much benefit to be gained by investigating this any further.

I also suggest that values for grass fed and finished on grain could be averaged, for labelling purposes.

3. Trimmed vs untrimmed

There is a separate sheet that shows the values here. I have provided an example of the calculation at the top of the sheet. Under that, I have not included the equations I used as, when you copy these lines across to other data sets, the values will change as cell references will be reading incorrect cells. I have kept a copy with the equations in it if necessary.

As expected, untrimmed lines have higher fat and energy contents than lean meats. It is notable for rump vs striploin, that although both have similar nutrient values in the lean portion, the striploin has more separable fat and therefore its untrimmed data are quite different.

For rump and lamb leg, the untrimmed values depend on how the meat is presented at sale. If the rump steak has no trimmable fat, then obviously it has less total fat etc than for those pieces of meat sold with selvedge fat attached. For lamb, the bone in leg has less separable fat, proportionally, than the mini leg (boneless). This presents a labelling dilemma that is a decision for MLA to make. On one hand, averaging all rump and all lamb leg gross composition gives a longer-term average that may be more relevant to consumers. On the other hand, it paints a "poorer" picture of cuts presented to be lean.

4. Changes in values compared to existing AFCD3 data

A separate sheet compares current and existing data for selected nutrients and for those cuts that have a close match in AFCD3.

Overall, the biggest changes noted were in niacin, iron, zinc and fatty acids. These differences were more notable in the separable fat than in the lean, which perhaps reflects differences in the amount of lean material inadvertently captured in the fat portion, given the difficulty of separating lean and fat in some cuts.

Differences in methods for niacin were noted above. Mineral and fatty acid methods of analysis are unchanged from existing AFCD3 data. The study design doesn't allow us to determine a reason for these differences, but they could represent a number of factors such as analysis operating conditions, seasonal production factors, trimming differences etc. Also of note is that the Williams study pooled a number of cuts for a single analysis for some nutrients.

Rump steak and lamb leg were reasonably consistent with existing data, whereas striploin was higher in fat than the existing data for sirloin, which perhaps reflects cut differences, among other factors?

Any differences in nutrient levels in the lean portion are also reflected in the untrimmed lines, but this is also affected by differences in the proportion of fat and lean at the point of sale. For untrimmed lines, only proximate values are presented in the spreadsheet.

Further, differences in cooked samples between new and old data also reflect the cooking method used, particularly as to how well cooked the samples are, reflected in their moisture content. A lower moisture content leads to a concentration of many other components, unless they are damaged by heat.

Overall, I would suggest that the newer data is used for labelling and consumer information purposes for these popular cuts, because it reflects current production practices and best-

practice analytical methods. However, given that proximate contents, in particular, are relatively consistent in the cuts studied compared to older data, there is no pressing need to reanalyse other cuts as values are likely to still be applicable, given the high degree of uncertainty in micronutrient analyses in particular. If of interest, future studies could examine iron and zinc levels in a wider range of cuts, and possibly fatty acids, niacin and B12 levels, although these are more expensive analyses. For simplicity, I would suggest replacing data for rump, striploin (sirloin) and lamb leg with the values from this study. FSANZ should consider adopting the same approach for their AFCD data for these cuts.

5. Answers to specific MLA questions

Question 1. Fatty acid calculations

"Paul's query doc states to calculate the actual amount of individual fatty acid in the sample, multiply the FAME% by the total fat content of the sample. Does this mean that you no longer use the 0.92 value you were using to calculate the fatty acids values in g or mg/100g. *Please confirm and check with Paul.*"

This is an area where there has been a bit of confusion in the past between myself and NMI. To confirm matters, I checked some current Food and Agriculture Organisation recommendations for food composition databases.

During the analysis of fatty acids in foods, the fatty acids are liberated from the fat matrix and converted to methyl esters. To then calculate the percentage of fatty acids in the total amount of fatty acids, NMI then apply a conversion factor (known as the Shepphard factor) to estimate this.

For vegetable oils and foods whose fat content largely derives from oils, almost all the fat present is in the form of triglycerides, which are glycerol molecules to which 3 fatty acids are attached. So, in these foods, almost all (estimated at about 97%) of total fat present is fatty acids. In this case, many people don't use any other factors because it makes very little difference to estimates of mass of fatty acids. However in many natural foods, such as red meat, there are other types of fats present that are not fatty acids – sterols (such as cholesterol) and phospholipids (in cell membranes). Therefore, when fatty acids are reported as a percentage of total fatty acids, as in this study, best practice is to apply an additional factor to the measured fat content to account for this (see attached).

For beef, lean beef has an assigned factor of 0.916 and separable fat has a factor of 0.953. FSANZ decided to round these factors to 0.92 and 0.95 respectively as most of the data includes a little of the other component in it. I have followed the approach of FSANZ in assessing this data, the only difference being that I used a factor of 0.93 for short ribs as they are a mix of lean and fat.

The calculation of mass of fatty acids is:

> Fatty acid content (g/100 g edible portion) = Fatty acid content (% of total fatty acids as reported by NMI) x total fat content (g/100 g)/100 g/100 g x fat factor.

Generally, it makes little practical difference whether or not a factor is used. However in this study, it does slightly reduce the mass of EPA+DHA.

Question 2. Rounding of values

> "The sum example of fatty acids doc that Paul sent is for eye round, grass fed, lean raw composite. The monounsaturated fatty acid calculation does not equal 46 it equals 45.6. *Why do they round it up? Should we use the rounded number.*"

As noted above, I have recalculated total values by summing individual acids. Rounding is common because it reflects uncertainty in measurements and makes it easier to present values without (confusing) decimal places. In the datafile I have sent, I have rounded values using the approach FSANZ uses.

Question 3. Omega 3 calculations

"**For the omega-3 calculations I need them explained further – step by step please.** And For labelling purposes can you include another column for the calculation of EPA C20:5w3 (column BT) and DHA C22:6w3 (column BX) only as that is what the regulations allow to be calculated to claim 30mg per serve of EPA and DHA."

As noted earlier, I added a column to assign a half LOR value to EPA and DHA where these were reported as <0.1%. I think it is appropriate to do this because we know from past analyses that they may be present, and we have measurable levels in some cuts. From this I was able to estimate a percentage total and then to calculate mass (as milligrams) using the formula above.

Question 4. CLA values

"I'm still unsure how to display CLA in the nutrition panel, It cannot be displayed as mg/g fat. Also the CLA values for grass fed fat raw and grass fed fat cooked don't make sense. How is the raw fat value higher than the cooked?"

I assume that for NIPs, values for CLA should be expressed on a per 100 g basis. Therefore I added a new column where I calculated value per 100 g food from the provided values of milligrams per g fat. I did this by multiplying the provided value by the analysed fat content. In this case I have not used a fat factor as I assumed the CLA value was measured directly on a mass basis.

When you express CLA on a per 100 g food basis, the apparent anomaly between raw and grass fed cooked largely disappears.

Question 5. Opinion on differences

"To help complete the data can you please do the following:

We require validation as well as your opinion to decide on differences. Therefore, for all rump and sirloin can you determine the % difference between AFCD current values, grass fed and finished on grain lean, raw and cooked values from the recent testing. I'm suggesting creating a new tab with columns that show the difference between the following nutrients of interest: Energy, protein, fat, saturated fat, EPA + DHA, iron, zinc, B12. This will help decide if there is a 25% difference between them then we can conclude if they are different or not. This

will provide confidence in the decision of the data we end up using. For eg which rump value do you suggest is an average representation of the market given that there are some cuts with separable fat and some without. For each cut decide the values – per 100g raw lean, per 100g untrimmed, per 100g cooked. The decision is do we combine the grass fed and finished on grain or do we suggest they are separate lines. The difference would need to be 25% or more to align with an increase FSANZ claim"

As advised, I have added a new sheet comparing new and old data for rump, sirloin and lamb leg. Differences between old and new data, on a percentage basis, are highlighted in pink shading.

Regarding rump, the easiest approach in terms of user communication is, I assume, to take the average of grass fed and grain fed cuts. This would represent the longer-term choices of consumers, assuming there is no market factor, such as price difference, to drive consumption one way or the other. Given the small differences between grass and grain (see above), it make sense to take the average. This wouldn't stop producers of grass-only cuts from using the grass only data if they chose.

Question 6. Add columns for EPA + DHA only

Done

Question 7. Express CLA in the excel sheet as it should be displayed in the nutrition panel

Done, assuming an NIP would use values per 100 g of food, as for other nutrients.

Question 8. As you mentioned below, update the less than values to the figure used for calculation either zero, 0.05, enter the value that is used for the calculation

Done, outlined above

Question 9. Share with me equations used in the sheet and what for.

I have covered this above (I hope). I can also provide them as required if I have missed any.

Question 10. Dot points summary of the differences found and your recommendations on further testing of cuts that have existing nutrition information on AFCD.

See above

Question 11. Recommendation to FSANZ on how the AFCD should be updated, what should be removed, what should remain and what should be replaced for red meat lines to keep it user friendly.

I suggest FSANZ consider the following:

- Replace existing lines for rump, sirloin and lamb leg to use the data from this study, with any gaps filled with existing data (e.g. for nutrients not covered in this study).
- Remove lines for semi-trimmed cuts, if not already done.
- Update names for cuts where marketing names might have changed (e.g. striploin vs sirloin)
- Include data for new cuts from this study (striploin, brisket).