# THE USDA NUTRIENT DATABASE FOR BEEF RETAIL CUTS TRIMMED TO 1/8" EXTERNAL FAT

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## Abstract

A study was conducted to validate the use of regression algorithms for estimating the nutrient content of beef retail cuts trimmed to 1/8-inch external fat. Ten USDA Choice and ten USDA Select beef carcasses were selected from two commercial packing plants (Texas and Nebraska). The carcasses were selected for physical characteristics, yield grade and marbling, which reflect the approximate distribution found in the US beef supply. Subprimals from each carcass were fabricated into retail cuts, trimmed to 1/8-inch external fat, and cooked prior to analysis. Each cut was analyzed for fat, protein, moisture, ash, amino acids, vitamins and minerals. Results from the current study were compared to predicted values for fat calculated from a 1993 market basket study using regression techniques. When compared to the previous study, results indicated that the regression algorithms were statistically consistent for five out of seven retail cuts: arm roast, bottom round, top round, top loin and top sirloin steaks. However, the results from two retail cuts (bottom round roast and eye of round roast) were inconsistent with the values derived by previous regression equations. New vitamin and mineral data on a variety of beef retail cuts trimmed to 1/8 inch external fat will also be presented. This study has validated the use of regression algorithms for predicting nutrient content for most beef retail cuts following changes in market trends as related to thickness of external fat trim. This current study also provides updated analytical nutrient data on beef retail cuts at 1/8 inch external fat trim, the prevalent trim dimension used in the market today. Improved breeding practices and meat product preparations have resulted in leaner retail cuts. The release of new beef composition data will allow consumers to make healthful choices in their diets. This analytical data would also provide researchers, consumers, nutrition professionals and government agencies the necessary information for establishing nutrition policy and in making diet and health recommendations.

## Introduction

Consumer demand in the last twenty years has reflected a growing concern for food products providing lower fat levels. The beef industry has strived to lower beef fat levels through improved breeding practices and meat product preparation. In 1988, a Market Basket Survey was conducted nationwide to determine the amount of subcutaneous fat trim present in beef retail cuts. Seven retail cuts were sampled nationally: chuck arm roast, bottom round steak, bottom round roast, eye of round roast, top round steak, top loin steak, top sirloin steak. The subcutaneous fat thickness was measured and weighed for each retail cut. It was found that the subcutaneous fat trim was significantly less in the retail cuts than the 1/2" fat trim reported by the USDA National Nutrient Database for Standard Reference (SR). As a result of this study, new analytical 1/4" data was entered into SR.

Over time, external fat trim of retail cuts continued to decrease. In 1993, weight and thickness values from the Market Basket Study were used to develop regression algorithms for predicting the reduction in subcutaneous fat for beef retail cuts trimmed to 1/8" external fat (See Figure 1). These reductions in subcutaneous fat were used to estimate the nutrient content of the 1/8" beef retail cuts. In 1999, the present analytical study was undertaken to verify and evaluate the accuracy of the algorithms and nutrient estimates predicted in the 1993 study.

## Objectives

- To validate the use of regression techniques for estimating the nutrient content of beef retail cuts varying in subcutaneous fat trim.
- To provide accurate and updated analytical nutrient data for beef retail cuts with 1/8" external fat trim.

## Methods and Materials

- Twenty beef carcasses (10 Choice, 10 Select) reflecting the distribution of the current US beef supply were obtained from two packing plants (Texas and Nebraska).
- Subprimals from each carcass were fabricated into retail cuts and trimmed to 1/8" or 1/4" external fat.
- The subcutaneous fat for the 1/8" and 1/4" trim cuts were removed and weighed. As in 1993, the fat weight and trim thickness were used to compute regression equations for estimating subcutaneous fat reduction (See figure 2).
- Estimates for subcutaneous fat reduction, percent separable lean, and percent separable fat were compared between both studies.
- Furthermore, each cut was analyzed for fat, protein, moisture, ash, vitamins and minerals for cuts trimmed to 1/8" external fat.

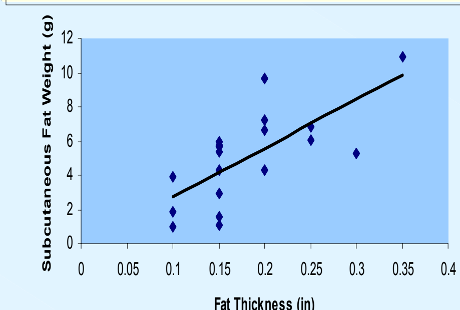


**Figure 1: Development of regression algorithms for estimating reduction in subcutaneous fat using data from the 1993 Market Basket Study. Data Points and Regression Line in this example are from Bottom Round Steak.**

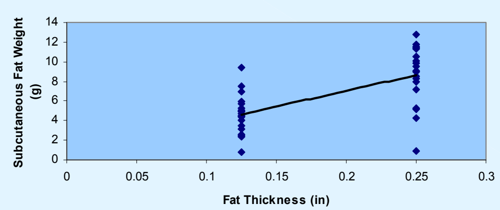


**Figure 2: Development of regression algorithms for estimating reduction in subcutaneous fat using data from the 1999 Analytical Study. Data Points and Regression Line in this example are from Bottom Round Steak.**

**Table 1: Comparison of estimates for subcutaneous fat and fat reduction generated by regression equations derived from the 1993 and 1999 studies.**

| Retail cut / Study | Number of samples | Subcutaneous fat wt 1/4" trim (g) | Subcutaneous fat wt 1/8" trim (g) | Amount of fat reduction (g) | T-Test | Probability |
|---|---|---|---|---|---|---|
| **Chuck Arm Pot Roast** | | | | | | |
| 1993 | 28 | 2.61 | 2.57 | 0.04 ± 0.90 | | |
| 1999 | 20 | 4.68 | 4.69 | 0 | 0.04 | 0.970 |
| **Bottom Round Steak** | | | | | | |
| 1993 | 19 | 7.06 | 3.47 | 3.49 ± 0.96 | | |
| 1999 | 20 | 8.21 | 4.62 | 3.59 ± 0.78 | 0.08 | 0.936 |
| **Top Round Steak** | | | | | | |
| 1993 | 29 | 4.45 | 2.81 | 1.64 ± 0.59 | | |
| 1999 | 20 | 5.82 | 3.69 | 2.13 ± 0.65 | 0.55 | 0.586 |
| **Top Loin Steak** | | | | | | |
| 1993 | 48 | 7.99 | 4.86 | 3.14 ± 0.88 | | |
| 1999 | 20 | 9.13 | 5.60 | 3.53 ± 0.79 | 0.27 | 0.790 |
| **Top Sirloin Steak** | | | | | | |
| 1993 | 39 | 6.00 | 4.10 | 1.90 ± 0.77 | | |
| 1999 | 20 | 6.00 | 4.35 | 1.65 ± 0.79 | 0.21 | 0.838 |
| **Bottom Round Roast** | | | | | | |
| 1993 | 8 | 9.48 | 9.10 | 0.37 ± 2.31 | | |
| 1999 | 20 | 9.07 | 6.19 | 2.88 ± 1.04 | -1.15 | 0.261 |
| **Eye of Round Roast** | | | | | | |
| 1993 | 12 | 8. 89 | 3.45 | 5.45 ± 1.35 | 1.09 | 0.283 |
| 1999 | 20 | 11.13 | 7.42 | 3.71 ± 0.93 | | |

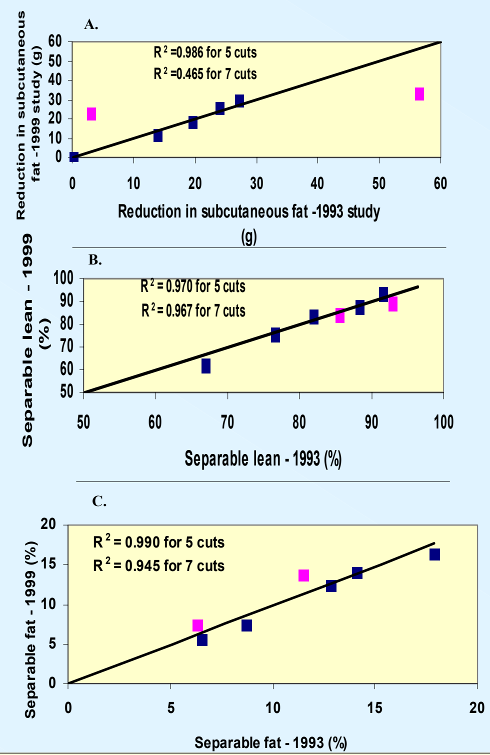


**Figure 3. Agreement in the estimates of fat reduction (A.), separable lean (B.), and separable fat (C.) between the 1993 Market Basket Study and the 1999 Analytical Study. The five cuts denoted in blue are arm roast, bottom round steak, top round steak, top loin steak and sirloin steak. The two retail cuts with large inconsistencies are denoted in pink: bottom round roast and eye of round roast. The line of unity denotes perfect agreement.**

**Table 2: Nutrient content per 100 g of food for selected beef retail cuts trimmed to 1/8" external fat [1]**

| Beef Retail cuts | Water g | Protein g | Fat g | Copper mg | Sodium mg | Iron mg | Zinc mg | Selenium mcg | Niaci nmg | Thiamin mg |
|---|---|---|---|---|---|---|---|---|---|---|
| Arm Roast | 62.33 ±0.47 | 19.23 ± 0.17 | 17.74 ±0.47 | 0.08 ± 0.017 | 62.4 ± 3.89 | 1.63 ± 0.10 | 4.54 ± 0.26 | 20.33 ± 5.57 | 4.33 ± 0.15 | 0.06 ± 0.06 |
| Bottom Round Steak | 66.88 ± 0.57 | 20.69 ± 0.19 | 11.54 ± 0.68 | 0.09 ± 0.04 | 56.2 ± 2.27 | 1.7 ± 1.08 | 3.82 ± 0.07 | 24.84 ± 4.7 | 6.18 ± 0.33 | 0.08 ± 0.04 |
| Top Round Steak[2] | 69.04 ± 0.32 | 22.05 ± 0.15 | 7.93 ± 0.38 | 0.09 | 59.98 | 1.85 | 4.07 | 26.50 | 6.58 | 0.08 |
| Top Loin Steak | 63.42 ±0.48 | 20.60 ± 0.13 | 15.49 ± 0.32 | 0.06 ± 0.04 | 51.64 ± 0.84 | 1.47 ± 0.08 | 3.5 ± 0.14 | 22.81 ± 3.7 | 6.07 ± 0.38 | 0.06 ± 0.09 |
| Top Sirloin Steak[3] | 66.09 ± 0.47 | 20.30 ± 0.17 | 12.70 ± 0.63 | 0.06 | 51.94 | 1.48 | 3.55 | 22.94 | 5.98 | 0.06 |

[1] Values are means " SEM ; For proximates, N=20; for vitamins and minerals, N=4.

[2] Vitamin and mineral data were imputed from values for the bottom round steak.

[3] Vitamin and mineral data were imputed from top loin steak.

## Results

- Estimates of subcutaneous fat obtained by regression equations between the 1993 Market Basket Study and the 1999 Analytical Study were in good agreement for five retail cuts ($R^2$ =0.986).
- Estimates of subcutaneous fat reduction for the bottom round roast and eye of round roast were in poor agreement between the two studies. When the data for all seven cuts were included in the regression analysis the $R^2$ dropped to .465.
  - **Small sample size in the 1993 study (n=8) and poor fit of data, as indicated by the large standard error, may account for the poor agreement noted for the bottom round roast**
  - **The 61% estimated reduction of subcutaneous fat for eye of round roast in the 1993 study exceeded the maximum expected thickness reduction of 50%.**
- Estimates of separable lean (%) and separable fat (%) for 1/8" cuts between the 1993 Market Basket Study and 1999 Analytical Study were in good agreement for all cuts ($R^2$ = 0.967, $R^2$ = 0.945, respectively).

## Conclusions

- This study has validated the use of regression algorithms for predicting nutrient content for most retail cuts following changes in market trends as related to external fat trim.
- New analytical nutrient data for beef retail cuts at 1/8" external fat trim, the prevalent trim dimension used in the market today, will be released in SR – 16 (June 2003).

## References

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