The transformation of hunger revisited: estimating available calories from the budgets of late nineteenth-century British households

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The Transformation of Hunger Revisited: Estimating Available Calories from the Budgets of Late Nineteenth-Century British Households

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Levels of nutrition among British worker's households in the late nineteenth century have been much debated. Trevon Logan (2006, 2009) estimated a very low average level of available calories. This paper re-examines the data and finds average levels of available calories much more in line with existing studies, more in line with what is known about energy requirements, and more in line with other aspects of the data. In sum, British households were likely to have been significantly better fed than Logan reports.

In this article we re-examine one facet of the relationship between income and nourishment. Based on his analysis of the household expenditure data set collected in 1888/89 by the United States Commissioner for Labor (USCL),[1] Trevon Logan (2006, 2009) inferred that the households of American and British industrial workers in that period were undernourished and hungry. Further, Logan offered evidence that these households were much worse off in terms of available calories than, for example, rural households in the Indian province of Maharashtra during 1983. Given that his evidence is inconsistent with the relativities in widely accepted national real income estimates, Logan explicitly entertained the possibility that such estimates are in need of revision (2009, p. 405–6).

These are puzzling conclusions. To put them into context, Angus Maddison's (2003) estimate for British per capita gross domestic product

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[1] Haines (1979).

(GDP) in constant U.S. dollars for 1890 is 3.8 times higher than his estimate for India in 1983. Adjusting for the position of Maharashtra among the states of India would do little to reduce that huge difference. This paper re-assesses Logan's findings for Britain.

Logan calculates average available daily calories per head at 1,390 for Great Britain. He compares these with an estimate, made by Shankar Subramanian and Angus Deaton (1996) of 2,098 calories for the rural parts of Maharashtra province in southwest India during 1983. To see how problematic Logan's estimate for Britain is, consider the following. Logan's results translate into an average of about 1,820 daily kcal per equivalent adult man. According to Roderick Floud et al.'s estimates (2011, p. 80), about 1,350 kcal is required to maintain body temperature and the function of vital organs (basal metabolic rate (BMR)), and this does not even allow for the energy required to eat and digest food. Consequently, a figure of about 1.27 BMR is needed to maintain life or about 1,715 kcal. While BMR varies with body mass, height, and climate, these are the lower bound for moderate climates (Floud et. al., p. 43). Logan's British diet implies 1,820 kcal per equivalent adult man, which would provide these late nineteenth-century individuals with more than 100 kcal for all physical activity during a 24-hour period.[2] If true, this would be insufficient for physical work.

The USCL survey used by Logan is of households headed by workers in export trades. Many of these workers such as coal miners and steel workers, were engaged in occupations requiring physically demanding manual work for long hours, so *a priori* Logan's estimates seem much too low. Logan's estimates are also a long way below Floud et al.'s (ibid, p. 167) estimates of around 2,500 calories per head in 1850 in England and Wales, and 2,977 calories per head for 1909–1913. Similarly, Ian Gazeley and Sara Horrell (2013) estimate much higher levels of the available nutrition of rural workers in late nineteenth-century Britain. Finally, as we discuss later, other aspects of the comparison between the USCL data and the Maharashtrian sample are inconsistent with these very low calorie estimates.

In the next section we discuss the USCL data set and that is followed by a detailed discussion and exposition of the methodological issues that confront the researcher wishing to convert food expenditures into estimates of available calories.

[2] Roderick Floud et al. (2011, p. 166) give a figure of 0.7646 to convert calorie figures from a per equivalent adult man basis to a per capita basis for England and Wales in the early twentieth century.

THE UNITED STATES COMMISSION OF LABOR DATA

Because of its value as a trans-national survey, the data collected for the 1890 and 1891 *Sixth and Seventh Reports* of the USCL have been widely used in research, see for example, Michael R. Haines (1979), Timothy J. Hatton, George R. Boyer, and Roy E. Bailey (1994), Sara Horrell and Deborah Oxley (1999), and Lynn Hollen Lees (1979). The survey was conducted by Carroll D. Wright (1840–1909). It is known from Jeffery G. Williamson's (1967) biographic sketch of Wright that he served in the Massachusetts Senate from 1871–1873, was persuaded to take over the Massachusetts Bureau of Statistics of Labor in 1873, and became the United States Commissioner for Labor in 1885. According to Williamson, Wright believed that "voluntary circulars were an inadequate source of data." As a result, he developed and perfected advanced census techniques with face-to-face interviews in a number of enquiries in Massachusetts before the *Sixth Annual Report* in 1890 (Williamson 1967, pp. 102–3). According to Haines (1979, p. 272), Wright was "one of the United States' great empirical statisticians." Because the *Sixth* and *Seventh Reports* were motivated by the McKinley Tariff question, he was interested in estimating the cost of production and the standard of living in nine industries producing internationally traded goods (Williamson 1967, p. 105). Data were collected from 24 states in the United States and five European countries (Belgium, France, Germany, Great Britain, and Switzerland). Nearly one-third of the international sample related to cotton textiles (31.8), while less than 10 percent related to steel coke and iron ore (9.9 percent). Further, 97.8 percent of the households in the sample were male-headed households (Haines 1979, pp. 293–4). For Britain, the sample comprised 1,024 households. The cotton, iron and steel, and Coal and coke industries were the most heavily represented. Most households, 777, declared themselves as English, with 128 Scottish, 80 Welsh, 38 Irish, and one declaring as Italian. There is only one female-headed household in the British sample.

The published reports provide only the briefest of description of the way in which families were selected and family structure and expenditure information recorded. The Report merely states (in relation to pig iron workers):

> The Department has aimed to secure accounts from a representative number of the employees of the establishments...and also from those families whose surroundings and conditions made them representative of the whole body of

> employees in any particular establishment. The representative character, however, has been impaired in some measure by two features: first some families have not been willing to give the information desired; while second, other families, perfectly willing, have not been able to give reasonably exact accounts of their living expenses.[3]

The Report highlights the fact that the families were asked to keep "accounts for a year's living" and that the word family is actually used to describe what we now define as households, as the family is defined as a "totality – husband, wife, children, boarders, everybody that goes to make up the household."[4]

It was not clear whether the sample was ever intended to be a random sample of families from the industries chosen. According to Lees (1979, p. 170), the head of the travelling commissioners claimed that employers supplied wage data and that "home visits were made in the company of trusted local people to ask for information when regular accounts were not kept." Henry Higgs, a contemporary writing in 1893, guessed that the yearly totals were estimated from records kept over a much shorter period (Lees, p. 170). Lees suggests that the biases of the data include an over-representation of "steadily employed" persons, as well as unknown selection criteria for individuals and firms within industries. Since region is not recorded it is impossible to investigate the extent of this bias.

A number of writers have attempted to investigate the extent to which the USCL survey was representative of workers in Britain in the 1890s. Lees examined the budgets of the sub- sample of 777 English households and found that more than one-half worked in the cotton and wool industries (52 percent) and that skilled workers "predominate." Lees thought that "While the sample is clearly biased away from the unskilled, from the transient, the irregularly employed, and the youngest workers, it clearly reaches far beyond an aristocracy of labor" (Ibid, p. 171). Further work on the biases of the USCL sample of British households was carried out by Hatton, Boyer, and Bailey (1994). They found that of the 956 workers considered, 263 were unskilled, 409 semi-skilled, and 284 were skilled. However, this categorization varied across industries such that "unskilled workers form the dominant group in pig iron and coke; semi-skilled workers the dominant group in cotton, wool and coal; and skilled workers the dominant group in steel, bar-iron and glass" (Hatton, Boyer,

[3] *Sixth Annual Report* of the United States Commissioner of Labor, pp. 610–11. This same passage is quoted by Haines (1979) and Hatton, Boyer, and Bailey (1994).

[4] Ibid, p. 611.

TABLE 1
WAGE DISTRIBUTIONS FROM THE 1886 WAGE CENSUS AND THE USCL HEADS OF HOUSEHOLDS

Percentage of Sample with Weekly Wages	Adult Men in the 1886 Wages Census	Heads of Households in the USCL British Sample
15 Shillings or less	2.6	1.3
Over 15 to 20 shillings	21.5	4.8
Over 20 to 25 shillings	33.6	16.6
Over 25 to 30 shillings	24.2	22.8
Over 30 to 35 shillings	11.6	22.5
Over 35 to 40 shillings	4.2	12.4
Over 40 shillings	2.4	19.6

Sources: Calculated by authors from the 1890–1891 United States Commissioner of Labor Data and 1886 Wage Census *British Parliamentary Papers* 1893–1894 [C.6889] "Wages. General report on the wages of the manual labour classes in the United Kingdom," p. 476.

and Bailey, p. 440). Looking at average income by industry, therefore, gives a misleading impression of the hierarchy of high- and low-wage industries. This point was further investigated by Horrell and Oxley (1999). In a comparison of the average income figures recorded in the USCL budgets with other data available for earnings in the industries, they found that although the male earnings were "in line with those for their occupations, the budgets oversample from the higher-paying occupations in each industry and the distribution of earnings for the whole sample thus falls into a higher range than that found for the industry as a whole" (Ibid, p. 499). Table 1 and Figure 1 illustrate Horrell and Oxley's point. They compare the distribution of recorded earnings in 1890–1891 with the 1886 wage census and show the extent to which the USCL likely oversamples heads of households with relatively high weekly earnings.

There is compelling evidence, therefore, to suggest that the workers sampled in USCL were not only engaged in heavy manual work but were also mostly in the higher-income part of the British wage distribution. For instance, the mean USCL wage of more than 31 shillings is in the top 20 percent of the 1886 wage census distribution.[5] This sampling has implications for Logan's findings. If these workers were heads of hungry households, then it is likely the households headed by lower-paid workers were on average even hungrier and very close to seriously inadequate diets.

[5] Price inflation was negligible 1886–1889/1990.

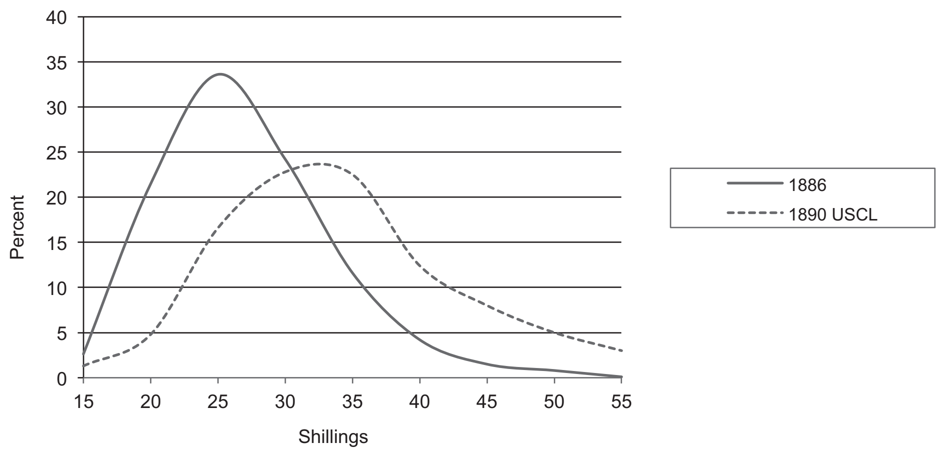

FIGURE 1
BRITISH WEEKLY EARNINGS DISTRIBUTIONS FOR ADULT MEN IN 1886 WAGE CENSUS AND IN USCL

Sources: Calculated by authors from the 1890–1891 United States Commissioner of Labor Data and 1886 Wage Census *British Parliamentary Papers* 1893–1894 [C.6889] "Wages. General report on the wages of the manual labour classes in the United Kingdom," p. 476.

CALCULATING AVAILABLE CALORIES IN THE USCL DATA

The food section of the USCL survey asks respondents to give an itemized expenditure "of a year's living." This was, in turn, aggregated to expenditure on more than 20 categories of food and converted to U.S. dollars. This level of aggregation is quite high and raises problems for the conversion of expenditures into quantities and calories. There are, however, some relatively homogeneous food categories for which the questionnaire asked for food quantities, mostly for items that tended to be sold by a standard weight. As we explain later, these include all the key foodstuff for calories, so the seemingly daunting problem of aggregation, for example of all fruit and vegetables, turns out in practice not to be a major problem for our purpose. From the point of view of calorie estimation food expenditure aggregation raises two issues: the choice of deflator to a unit of weight and the choice of conversion into calories.

Logan constructed prices to deflate budget expenditures for each of the food categories, by taking the average of the reported British prices for foods in the Aldrich Report (U.S. Senate Committee on Finance, 1892).[6]

[6] The Aldrich Report was a large study of wages, prices, and costs commissioned by the U.S. Senate Committee of Finance, of which Senator Nelson Aldrich was a member. Carroll Wright was a co-author of one of the volumes of the Report.

The example he uses is the case of butter, of which two types, creamery and dairy, were recorded and these were averaged to create the butter price (Logan 2006, p. 317). The British prices themselves were collected from a limited number of stores in Leeds, Manchester, and Liverpool in June of 1889. The averages taken from the Aldrich Report are listed in the first column of Table 2. These, however, are not the only prices available. To reach a broader view of the validity of the Aldrich prices, prices are taken from two alternative sources. The USCL survey collected both expenditures and quantities purchased for some foods. The mean implicit deflator from USCL is presented in the second column of Table 2. The most important external source comes from the *British Parliamentary Papers (BPP)*, House of Commons Report on wholesale and retail prices for 1903 (BPP HC.321, 1903). This reports time series of retail prices for a large number of food types, often differentiated by quality and place of sale although many are retail prices from London stores (presented in column 3).

A second important source of important food prices is the *Labour Gazette* that regularly published prices from Co-op stores around the country. These are listed in column 3. The fifth column of Table 2 gives our "best" set of prices, which are the USCL deflators where we have them with gaps filled in from the BPP HC.321 column.[7] Bread, flour, butter, pork (particularly bacon), sugar, meat, and potatoes are the key foodstuffs for calories in this sample for nutrition. For flour, butter, and sugar the "mixed source" price is above our Aldrich price, while for bread and pork the reverse is true and for meat the prices are identical. It is relevant that all price differences for these energy-important foodstuffs are less than 5 percent. As a consequence, the estimated quantities—and hence our estimates of energy available from the diets—are not significantly affected by these price differences.

To convert from quantities to calories, we take calorie values from Nutribase (2001) as did Logan (2006, 2009). This source is encyclopedic and gives nutrition data for a vast array of foods. For instance, it offers more than 350 types of bread, with wide variation in calorie estimates. The approach taken here is to sample from Nutribase by food category, and then use the mean calories from our sample as well as, where possible, values that are plus or minus two standard deviations from the mean. These estimates are given as the first three columns of Table 3. The fourth column is from the British standard source of nutritional

[7] The variations in prices for some foodstuffs undoubtedly derive from variations in quality, and limited sampling methods. Our preference is to first use prices derived from the USCL survey, and secondly the House of Commons report HC.321.

TABLE 2
COMPARISON OF US¢ PRICES USED FOR CONVERSION OF EXPENDITURE TO QUANTITY

Foodstuff (Pounds, Unless Indicated)	Mean Aldrich Price	BPP HC.321	Mean Co-op Price	Mean USCL Deflator	Mixed Source Price
Meat	16.5	19.5	—	—	16.5
Flour	2.89	3.03	2.53	—	3.03
Butter	24.3	28.0	27.5	25.2	25.2
Milk (per pint)	—	4.15	3.24	—	4.15
Tea	44.2	59.1	50.6	52.4	52.4
Pork	16.1	18.3	—	15.3	15.3
Sugar	4.80	4.15	5.71	4.90	4.90
Potatoes	—	1.56	1.56	1.01	1.01
Eggs (per dozen)	21.6	31.1	—	21.2	21.2
Vegetables	11.2	2.03	—	—	2.03
Fish	13.7	8.3	—	—	8.3
Bread	3.50	3.11	2.59	—	3.11
Coffee	29.7	40.1	—	—	40.1
Lard	14.2	14.5	—	12.3	12.3
Fruit	7.30	5.17	—	—	5.17
Cheese	15.5	17.9	16.6	—	17.9
Rice	7.30	4.67	—	—	4.67
Molasses	1.85	6.74	—	—	6.74
Condiments	42.1	16.6	—	—	16.6

Sources: For retail prices in Table 2:

(a) Column 1: U.S. Senate Committee on Finance. *Retail Prices and Wages: A Report by Mr. Aldrich*...

(b) Column 2:

Bread: BPP, HC.321 1890 large firm price (from Baker's Record), p. 223.

Butter: HC.321 mean of Danish and Irish Butter London quarterly prices 1890, Firm A, p. 285.

Cheese: HC.321 weighted average of home-produced Cheddar (0.75) and imported American and Canadian cheese (0.25); 1890 price Firm A, p. 290.

Coffee: HC.321 mean of Mocha roasted and ground, Costa Rica ground; London price 1890 Firm A, p. 330.

Eggs: HC.321, mean of quarterly prices for new laid eggs, 1890, Firm A , p. 297.

Lard: HC.321, mean of London price of Lard 1890, Firm (by block per pound) A and Firm D (per packet per pound), p. 278.

Fish: HC.321 commences 1898. Mean of quarterly London price for Haddock and whole Cod, Firm A, p. 298.

Note that the price of preserved Salmon was 7.5d/pound in 1891 (Firm A, p. 300).

Fruit: Prest (1954) average price 1900 of apples and pears, Table 32 p. 60.

Flour: HC.321 mean London 1890 price of household flour per seven pounds, Firm A and Firm D, p. 236–7.

Pork: HC321 mean London 1890 price of three cuts (belly, chops, legs), Firm A, p. 272.

Meat (assumed to be mutton): HC.321 weighted average 1890 March and September price of four cuts of British Mutton (0.75) and eight cuts of imported New Zealand Mutton (0.25), price Firm A, p. 268–9.

Sugar: HC.321 average of 1890 London prices for Demerara and granulated sugar Firm A and C, p. 304 and 306.

Tea: HC.324 average of 1890 London prices of three types of China and three types of Indian tea Firm A, p. 325.

Vegetables: Prest (1954) average of 1900 price for cabbage, beans, peas, turnip, carrot, and onions. Table 29, p. 52.

Condiments: HC.321 average of 1890 London price of vinegar (Firm C per quart bottle) and ground black pepper per pound (Firm A), p. 339 and p. 340.

Beef: HC.321 average of 1890 London prices (March and September) for 5 cuts of meat, Firm A p. 260.

Potatoes: HC.321 average of 1893–1894 price for potatoes Firm A (number of pounds per 12d), p. 259.

Rice: HC.321 average of 1890 London price per two pounds for five types of rice (Firm A), p. 240.

Molasses: HC.321 average 1890 London price per two pound tin for golden syrup dark and light, Firm A p. 308.

Milk: HC.321 average 1890 London "prevailing retail price," p. 279.

(c) Column 3: Co-operative store prices (average of 91 societies, 1893), The Labour *Gazette,* August 1893, p. 88, for Bread, Butter, Cheese, Bacon, Flour Sugar, Tea, Potatoes, Milk and Fresh Meat. The *Gazette* also lists the price of Margarine and Jams/Marmalade, which have not been used.

(d) Column 4: Authors' calculations from USCL data.

TABLE 3
CALORIES AVAILABLE BY FOOD, PER 100G, FROM NUTRIBASE AND MCCANCE AND WIDDOWSON

Food Type	Kcal Nutribase Average	Kcal Nutribase Low	Kcal Nutribase High	Kcal McCance/Widdowson
Beef	260	115	368	216
Pork	233	233	506	280
Mutton	187	87	261	237
Eggs	49	49	49	147
Lard	814	814	814	891
Butter	716	716	716	740
Tea	0.3	0.3	1.2	1
Coffee	2.3	2.3	2.3	2
Sugar	351	351	351	394
Molasses	374	327	383	277
Potatoes	44.2	37.2	46.5	75
Poultry	224	90	326	65
Fish	77	68	78	65
Milk	239	239	490	65
Flour	334	334	334	350
Bread	250	224	250	245
Rice	299	222	342	361
Cheese	328	175	437	406
Fruit	56	15	77	1
Vegetables	38	21	49	2

Sources: Nutribase (2001) and Paul and Southgate (1979). See text from method of calculation.

information, commonly referred to as McCance and Widdowson (Paul and Southgate 1979).

There are some notable differences between these sources. The mean Nutribase values are lower than the McCance and Widdowson values for meat, eggs, and cheese and a lot higher for milk.[8] Table 4 provides estimates of annual average household consumption of each food type. Column 1 reports average consumption (in pounds) derived from reported quantities in USCL survey reports, where available, and otherwise from the expenditure data deflated by the appropriate retail prices given in BPP HC.301.

In column 2 we convert average annual consumption to units of 100g and in columns 3, 4 and 5, these figures are used to derive daily household energy estimates using the Nutribase average, Nutribase low, and

[8] The reasons for these differences are very difficult to trace, but, aside from sampling error, they may be do to differences in food processing. However, as we report later, our resulting available calories conversions are similar for the two sources.

TABLE 4
AVERAGE ANNUAL CONSUMPTION PER HOUSEHOLD

Food Type	Average Consumption	Mean Consumption	McCance/ Widdowson	Nutribase Average	Nutribase Low
Period	Annual	Annual	Daily	Daily	Daily
Unit	Pounds	Kg/10	Kcal	Kcal	Kcal
Flour	890.37	4038.68	3872.7	3695.7	3694.0
Meat-other	413.55	1875.84	1218.0	961.0	446.9
Butter	112.00	508.03	1030.0	996.6	996.1
Sugar	198.48	900.29	971.8	865.8	865.4
Potatoes	886.88	4022.87	826.6	487.2	409.8
Bread	149.63	678.71	455.6	464.9	416.3
Milk	361.62	1640.30	292.1	1074.1	1073.6
Pork	69.39	314.76	241.5	200.9	200.8
Lard	16.02	72.66	177.4	162.0	162.0
Eggs	40.71	184.68	74.4	24.8	24.8
Fish	84.13	381.63	68.0	80.5	71.1
Molasses	6.26	28.41	21.6	29.1	25.4
Cheese	3.18	14.43	16.1	13.0	6.9
Rice	2.20	9.97	9.9	8.2	6.1
Vegetable	51.90	235.41	1.3	24.4	13.8
Tea	26.56	120.48	0.3	0.1	0.1
Coffee	8.17	37.05	0.2	0.2	0.2
Fruit	12.58	57.06	0.2	8.7	2.3

Source: Authors calculations from the data on British households in the USCL data set.

McCance and Widdowson nutritional values. For those foods that are recorded separately, the importance of bread (baked and as flour) and butter in the diet is instantly visible in Table 4. Moreover, because the energy conversion factors of these items do not vary too much by source, the broad calorie story is almost the same for whichever conversion is used.[9] One further aspect of the survey is worth noting here. Respondents were asked to estimate how much they spent of "other foods." The answers ranged from zero (for more than 20 percent of households) to 30 percent of all spending in one particular case. For almost 94 percent of all households the share of other foods was 10 percent or less, and the average share was 3.6 percent. It is possible meals eaten outside the home accounted for some of this spending, and also some low calorie purchases like condiments and vinegar. We decided simply to gross up our calorie estimates by the expenditure share of other foods. If we are correct on the possible kinds of expenditure reflected in this spending, then we might

[9] Using the Aldrich prices made only very marginal differences when compared with HC.321, so we proceed using only this latter set of prices.

TABLE 5
MEAN DAILY CALORIES AVAILABLE, PER CAPITA, ESTIMATES,
ALL USING STONE PRICES
(For reference, Logan (2006, 2009) estimates a mean of 1,390 Kcal)

Kcal Conversions	Sum of Columns of Table 4	Direct from the Data	Sum of Columns of Table 4	Direct from the Data
Adjusted for other foods?	No	No	Yes	Yes
McCance and Widdowson	1855	1968 (19.3)	2134	2245 (23.1)
Nutribase Minimum	1683	1616 (15.5)	1936	1843 (17.2)
Nutribase mean	1819	1753 (16.9)	2092	2000 (20.3)

Note: The terms in brackets in the second and fourth columns and standard errors.
Source: Authors calculations from the data on British households in the USCL data set.

induce a small upward bias into our calorie estimates, since meals taken outside the home would have been relatively expensive and condiments contain few calories.

Per capita daily calorie intakes are estimated in several ways and presented in Table 5. In columns 1 and 2 no adjustment is made for "other food," while that adjustment is made in columns 3 and 4. Column 1 is the sum of all foods reported in Table 4, using different nutritional conversions, divided by the mean household size. The energy values reported in column 3 inflate this total by food expenditure on other foods as a proportion of total food expenditure. This method treats these unspecified other foods as nutritionally equivalent to the average value of all specified foods. Totals are reported with and without this adjustment. Columns 2 and 4 report estimates directly from the household data, so these are the sample mean per capita daily calorie estimates, with standard errors attached. In principle the two numbers should be identical. However, the mean calorie numbers in Table 4 and thus in columns 1 and 3 of Table 5 are from all available observations, rather than observations where estimates for all foods are present, which is the case from columns 2 and 4 of Table 5. Whichever method is used to calculate the nutritional value of the diets of British households in the USCL survey, these estimates of available energy per capita are much higher than Logan's.

Our best estimate is that the energy available to the British urban households included in the USCL survey was around 2,000–2,200 kcal per capita per day, or 2,600–2,900 kcal per equivalent adult man, excluding calories from alcoholic drinks. This is about 50 percent above Logan's estimate, of less than 1,400 kcal per capita per day, from the same source. If we were to add energy from alcohol consumption, it would probably raise our estimate by about 400 kcal (see Gazeley and Newell 2012, p. 17).[10] We note that this preferred estimate also is similar to Gazeley and Horrell's recent findings for the energy available to agricultural laborer's households of 2,153 kcal per capita per day in 1893–1894, which already includes some allowance for energy from alcohol (Gazeley and Horrell 2013, p. 12).

If we consider the comparison between Britain in 1890 and Maharashtra in the early 1980s, recall that Logan (2009) suggests the households of some of the better-paid British workers around 1890 had many fewer calories at their disposal than rural families in Maharashtra in the early 1980s. This result stems from the particularly low calorie conversion in Logan's work. There are two other aspects of the comparison that suggest the reverse relativity. The first one stems from the finding that in both the USCL and the Maharashtra samples, the price of calories purchased in the form of meat was around ten times that of calories purchased in the form of cereals.[11] Among the Maharashtrian households, expenditure on meat was on average about 5 percent of total food spending (Subramanian and Deaton 1996, Table 1). In the USCL sample, by contrast, the share of meat expenditure was more than five times larger on average, at 25.5 percent. Making any reasonable allowance for cultural differences, it is very hard to believe that households with such low levels of available calories as Logan estimates would deliberately make themselves even hungrier by allocating so much of their budget to this most expensive form of energy.

Secondly, Subramanian and Deaton give the mean food share for the Maharashtrian sample at 67 percent; whereas the average food share in the USCL British data is 50 percent, and the Maharashtrian mean food share of 67 percent lies above the 95th percentile of the British sample. The food share is very reliable (inverse) index of economic well-being with a long history (see, for example, Almås 2012) and it is unlikely that urban households surviving on very few calories would deliberately devote so few of their resources to food. These comparisons strongly support our higher estimates of available calories among USCL 1890 households.

CONCLUSIONS

This article re-estimates the calories available to British worker's families in the USCL survey, using a range of conversions of food expenditure estimates to calories. In contrast to Logan (2006, 2009) who argued

[10] Alcohol is not recorded in the survey. But there is evidence that it was a significant source of energy.

[11] Authors' own calculations and Subramanian and Deaton (1996, Table 1).

that caloric intake was very low, our new estimates are more in line with those of other scholars, and are more plausible *a priori*, given what is now known about the energy needs for basal metabolism. This paper also stresses the importance of the careful use of conversion systems in the assessment of nutritional adequacy from budget studies.

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