The Journal of Nutrition
Issues and Opinions

The Thrifty Food Plan Is Not Thrifty When Labor Cost Is Considered[1,2]

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Abstract

Recent research has shown that the typical Supplemental Food Assistance Program (SNAP) family falls short in meeting the Thrifty Food Plan (TFP) nutritional guidelines that underlie the SNAP even when they typically have sufficient monetary resources to eat a healthful diet (i.e. to follow the TFP recommendations). However, the TFP does not consider labor cost. This study uses a basic labor economics technique to value labor in a home food production scenario that is required to reach the TFP nutrition and budget targets and calculates the total cost (inclusive of labor) associated with the TFP. This TFP consistent total cost is then compared, using several metrics, with the total cost associated with actual choices made by those families sharing the same profiles as current SNAP participants. Once labor is included, we find the TFP is not very thrifty and the mean household falls short of the TFP guidelines even with adequate monetary resources. J. Nutr. 140: 854–857, 2010.

Introduction

The Thrifty Food Plan (TFP)[5] is a key component in determining the amount of money available to participants in the Supplemental Food Assistance Program (SNAP), formerly the Food Stamp Program. As stated by the USDA, the TFP "serves as a *national standard for a nutritious diet at a minimal cost* [emphasis added] and is used as the basis for food stamp allotments" (1). The TFP is essentially a nonlinear mathematical programming model that is used to provide a diet pattern recommendation along with the associated monetary cost that meets the "national standard for a nutritious diet" (1) for food prepared at home. Unfortunately, the TFP does not consider food preparation time and therefore implicitly assumes time is an unlimited (free) resource. Of course time (labor) is not unlimited and is a crucial input in food production at home.

The typical SNAP family falls short of meeting the TFP nutritional guidelines even when the family typically has sufficient monetary resources to eat a healthful diet (i.e. to follow the TFP recommendations) (2,3). The central question is: Why? Though there are likely several reasons, we consider a basic economic explanation. Introductory economics indicates that in producing any type of output, such as a nutritious meal, individuals will look for the least cost input combination to achieve that output (4). Ignoring an important input (such as labor) in the cost comparison calculation will underestimate the real cost of the inputs. The question we then seek to answer is: how thrifty is the TFP once we include labor cost?

Recent research has supported the fact that ignoring the labor cost will underestimate the total cost required to reach the TFP nutrition target (5,6). However, these studies did not directly answer to what extent the labor cost will affect the effectiveness of the TFP. To directly answer that question, we used a basic labor economics technique to value the labor in a home food production scenario that is required to reach the TFP nutrition and budget targets and calculate the total cost (inclusive of labor) associated with the TFP. This TFP total cost is then compared in several different ways with the total cost associated with actual choices made by those families sharing the same profiles as current SNAP participants. Once labor was included, we found the TFP is not very thrifty. Consequently, considering the total cost of food, it may not be too surprising that households fall short of the TFP guidelines even with "adequate" monetary resources.

With 2 main inputs (food and labor), the total cost of producing a homemade meal for the entire household is the sum of food monetary costs (M) and labor time costs (T), or

$$TC = M + T = p_F F + p_L L = M + p_L L, \qquad (1)$$

where TC is the total cost of producing a homemade meal for the whole household, p_F is the price of food, F is the quantity of food, p_L is the price of labor in food production, and L is the amount of labor time involved in food production. Because we generally observe the total food monetary expenditure (M) and can find measurements for price of labor and time (p_L, L), we will use the last equality in Eq. 1 to perform the analysis.

[1] Supported by the Food and Nutrition Assistance Programs at the USDA (project no. 58-5000-6-0075). The views expressed here do not represent the views of USDA.

[2] Author disclosures: G. C. Davis and W. You, no conflicts of interest.

[5] Abbreviations used: ATUS, American Time Use Survey; BLS, the Bureau of Labor Statistics; CPS, Current Population Survey; FSS, Food Security Supplement; SNAP, Supplemental Nutrition Assistance Program; TFP, Thrifty Food Plan.

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Manuscript received December 1, 2009. Initial review completed January 7, 2010. Revision accepted January 24, 2010.
First published online February 24, 2010; doi:10.3945/jn.109.119594.

Several manipulations of Eq. 1 provide numerous useful evaluation metrics. First, evaluating Eq. 1 at the actual money and labor combinations (M_{Actual}, L_{Actual}) gives the actual total cost TC_{Actual}. Similarly, evaluating Eq. 1 at the money and labor combination required to reach the TFP (M_{TFP}, L_{TFP}) gives the TFP total cost TC_{TFP}. Note Eq. 1 shows that there are numerous possible input combinations that could yield the same total cost, so just because a family is not following the TFP input levels (F or L) does not imply the household is spending more or less than the total cost associated with the TFP.

Second, the cost shares for food and labor are: $s_F = M \div TC$ and $s_L = p_L L \div TC$, respectively. Calculating input cost shares using Eq. 1 will shed light on the distribution of the 2 input costs: if the TFP equivalent cost shares for labor is much larger than the actual choices made by the household ($s_L^{TFP} > s_L^{Actual}$), it indicates that the TFP requirement is more labor intensive.

In addition, to measure the excess (deficit) a family is spending relative to that required by the TFP, one could take the ratio of actual total cost to total cost associated with the TFP (i.e. $TC_{Actual} \div TC_{TFP}$). If this ratio is >1, then the household is spending more than enough to meet the TFP requirement of the total cost. Of course if one assumes there is no labor cost involved, this ratio reduces to the ratio of food expenditures ($M_{Actual} \div M_{TFP}$) and this ratio could be very different from the total cost ratio if labor cost is sizable (i.e. the cost share of labor s_L is large). This food expenditure ratio may be >1, indicating the family is spending more than enough to meet the TFP, whereas the total cost ratio could be <1, indicating the family is not spending enough (i.e. $M_{TFP} < M_{Actual}$ does not imply $TC_{TFP} < TC_{Actual}$).

Finally, to answer a question such as: "What is the maximum labor time needed that will still make the TFP total cost thrifty (i.e. $TC_{TFP} \leq TC_{Actual}$)?" we use this inequality to determine the upper limit on labor time (L) required that would make the TFP total cost less than the actual total cost while keeping food expenditure amount (M) unchanged. This upper limit on labor is $L^U_{TFP} \leq (M_{Actual} - M_{TFP})/p_L + L_{Actual}$. A similar question can be answered for the maximum food expenditure needed to satisfy the same inequality ($TC_{TFP} \leq TC_{Actual}$), holding the amount of labor constant, and this upper money limit is $M^U_{TFP} \leq M_{Actual} + p_L(L_{Actual} - L_{TFP})$. The U superscript on both conditions indicates the upper bound. The summary of the metrics formula discussed in this section is provided (**Table 1**).

To calculate these various metrics requires household level data on actual food expenditures (M_{Actual}) and labor time in food production (L_{Actual}), TFP consistent food monetary expenditures (M_{TFP}), labor in food production (L_{TFP}), and the price of labor in food production (p_L). We limited the analysis to single-headed households, because these households comprise the majority of SNAP participants (7). We mapped the data sources with the components in the TC formula (**Fig. 1**). For calculating the actual monetary and time amounts (M_{Actual}, L_{Actual}), 2 datasets sampled from the same subset of the Current Population Survey (CPS) were linked by unique household identifiers: the 2004–2007 Food Security Supplement (FSS) and 2005–2008 American Time Use Survey (ATUS). Two published USDA documents were used for the amount of food expenditure and time required to meet the TFP goals (M_{TFP}, L_{TFP}). The amount of money associated with the TFP (M_{TFP}) depends on the actual household composition (e.g. household members and ages) and the above merged data from FSS and ATUS provided sufficient household composition information for us to assign the TFP food monetary expenditure amounts to appropriate households. The price of labor (p_L) comes from the Bureau of Labor Statistics (BLS).

The actual food monetary expenditure and labor time (M_{Actual}, L_{Actual}) components were calculated from a data set merging the FSS and the ATUS. Both FSS and ATUS are subsets of the CPS. The CPS is a monthly labor force survey of ~60,000 households conducted by the Census Bureau for the BLS. Once each year, after answering the labor force questions from the CPS, the same households are asked a series of questions about food security, food expenditures, and use of food and nutrition assistance programs and this information is the core content of the FSS. The actual food monetary expenditures observed (M_{Actual}) are "usual" weekly household food expenditures reported in the FSS.

The actual labor time (L_{Actual}) comes from the ATUS. The ATUS households are chosen from the CPS households that completed their 8th (final) interview. The ATUS contains demographic, hourly wage rate, and time use information. The ATUS collects individual time allocation data from a designated person about his or her activities the previous day. The ATUS households are stratified by race, ethnicity, and the presence of children and are selected to ensure nationally representability. The ATUS sample is randomized by day with 50% of the sample reporting weekday activities and 50% reporting Saturday and Sunday activities. We considered 6 categories of time in ATUS that contribute to household food production: Food and Drink Preparation (ATUS Code 020201), Food Presentation (ATUS Code 020202), Kitchen and Food Clean-up (ATUS Code 020203), Grocery Shopping (ATUS Code 070101), and Travel Related to Food and Drink Preparation, Clean-up, and Presentation (ATUS Code 180202).

The TFP-required amounts on food monetary expenditure and time components in the TC formula (M_{Actual}, L_{Actual}) come from 2 USDA published documents (8,9).

The USDA food plan report provides weekly TFP food costs for individuals by gender and age categories (8). Therefore, the TFP equivalent household food expenditures (M_{TFP}) vary by household compositions. The merged data from FSS and ATUS contain information on age and gender for each household member. This information enabled us to calculate the M_{TFP} for each household in our sample by summing the age-gender–specific individual costs and then multiplying by a scale adjustment as described in the footnotes of the USDA report tables (8).

As indicated, the TFP does not take into account labor, so estimates of the amount of labor associated with the TFP (L_{TFP}) are a little more tenuous. However, in 2000 the USDA Center for Nutrition Policy and Promotion published *Recipes and Tips for Healthy, Thrifty Meals* (9). As stated in this USDA document,

TABLE 1 Definitions for metrics

Metric name	Metric formula
TFP total cost	$TC_{TFP} = M_{TFP} + p_L L_{TFP}$
Food expenditure share of TFP total cost	$s_M^{TFP} = M_{TFP} / TC_{TFP}$
Labor expenditure share of TFP total cost	$s_L^{TFP} = P_L L_{TFP} / TC_{TFP}$
TFP upper food expenditure bound	$M^U_{TFP} \leq M_{Actual} + p_L (L_{Actual} - L_{TFP})$
TFP upper time expenditure bound	$L^U_{TFP} \leq (M_{Actual} - M_{TFP}) / p_L + L_{Actual}$
Actual total cost	$TC_{Actual} = M_{Actual} + p_L L_{Actual}$
Food expenditure share of actual total cost	$s_M^{Actual} = M_{Actual} / TC_{Actual}$
Labor expenditure share of actual total cost	$s_L^{Actual} = p_L L_{Actual} / TC_{Actual}$
Actual:TFP food expenditure ratio	$r_M = M_{Actual} / M_{TFP}$
Actual:TFP total cost ratio	$r_{TC} = TC_{Actual} / TC_{TFP}$

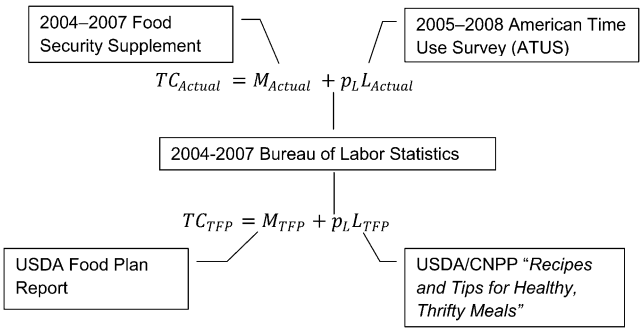

FIGURE 1 Data sources.

"The menus presented here conform to the recommendations contained in the Dietary Guidelines for Americans and the USDA Food guide Pyramid" (9). This USDA publication contains 40 recipes and the associated amount of time needed for food preparation and cooking, which were used to form the estimate of L_{TFP}.

The last component in both the TFP and the actual measurements is the value of labor time in food production. There are 2 ways in the labor economics literature to measure the value of time: the opportunity cost approach and the market substitute approach (10). In this study, we used the market substitute approach, which values the household labor at the rate that the same activity could be purchased on the market. The market substitute price (p_L) we used is the median hourly wage rate from the 6-digit standard occupational classification for private household cooks collected by the BLS for 2004–2007: $9.37, $10.01, $11.00, and $11.67, respectively (11). As Gronau (10) indicated, the market substitute approach tends to produce a lower value of labor than the opportunity cost approach. This appears to be the case in this application as well. Using the ATUS 2003 data within the opportunity cost of time approach, Davis and You (6) estimated the shadow value of food production time at ~$14.00/h for a similar population.

There are a few empirical implementation hurdles that must be explained and confronted. First, food expenditures in FSS are reported on a weekly basis, but time expenditures in ATUS are reported on a daily basis. Because all days of the week are represented in the ATUS sampling process, we exploited this information and used a Horovitz-Thompson type estimator to estimate total weekly time for each individual (12). This Horovitz-Thompson type procedure uses the sample mean for days of the week when the individual was not sampled coupled with their reported time for the day they were sampled to generate a weekly time estimate. Because of the stratified sampling design, the final sampling weights will be used in all calculations.

Second, a sample 2-wk meal plan for a family of 4 based on these 40 recipes is given in the USDA Recipes and the mean weekly food preparation time in this plan is 16 h/d or 2.28 h/d (9). Obviously, other recipe combinations and therefore labor requirements are possible from these 40 recipes. To gauge the sensitivity of the results, we cut this estimate in half and present the results for 2 cases: L_{TFP} = 16, L_{TFP} = 8.

Third, there are perhaps concerns about scale effects for the other inputs (M_{Actual}, T_{Actual}, and T_{TFP}) similar to that for M_{TFP}, where values are adjusted for family size. Scaling is as much an art as a science and specific values are difficult to justify. If the data are already at the household level, such as actual food expenditures (M_{Actual}), then no scaling is required. This leaves the possible need to scale T_{Actual} and T_{TFP}. As a reviewer points out, the time in food preparation is probably rather constant by family size. Furthermore, we worked with single-headed households, so it would seem reasonable to assume this individual is the main food preparer and the reported actual time (T_{Actual}) is the household time. With respect to the TFP time estimate (T_{TFP}), although the time estimate may vary by family size, we believe there is more variation due to alternative combinations of recipes that could constitute a weekly meal plan. In either case, this is another reason for conducting the sensitivity analysis discussed above.

In addition to limiting the analysis to single-headed household, we trimmed the top 1% of observations from our data in terms of actual money expenditures and time expenditures to minimize the influence of outliers. There were then 6331 households used in the final analysis.

We present the results of the analysis for the 2 levels of labor consistent with the TFP (i.e. L_{TFP} = 16, L_{TFP} = 8) to gauge the sensitivity of the results (**Table 2**). All summary statistics used sampling weights inherent in the FSS-ATUS data. Regardless of the value of L_{TFP} used, the mean total cost (i.e. average across different household compositions) associated with the TFP is higher than the mean actual total cost. The mean total cost of homemade meals is ~$20/wk more if the labor requirement to

TABLE 2 Weighted summary statistics for metrics[1]

	Mean		SD		99% Percentile interval	
Metric	L_{TFP} = 8	L_{TFP} = 16	L_{TFP} = 8	L_{TFP} = 16	L_{TFP} = 8	L_{TFP} = 16
TFP total cost, *$*	170.74	254.93	47.05	48.95	[110.72, 302.20]	[185.68, 389.75]
Food expenditure share of TFP total cost	0.47	0.32	0.13	0.11	[0.30, 0.72]	[0.17, 0.56]
Labor expenditure share of TFP total cost	0.53	0.68	0.13	0.11	[0.28, 0.70]	[0.44, 0.83]
Actual total cost,[2] *$*	153.81	153.81	70.83	70.83	[52.61, 388.78]	[52.61, 388.78]
Food expenditure share of actual total cost[2]	0.64	0.64	0.17	0.17	[0.15, 0.88]	[0.15, 0.88]
Labor expenditure share of actual total cost[2]	0.36	0.36	0.17	0.17	[0.11, 0.84]	[0.11, 0.84]
Actual:TFP food expenditure ratio[2]	1.34	1.34	0.82	0.82	[0.17, 4.15]	[0.17, 4.15]
Actual:TFP total cost ratio	0.90	0.59	0.34	0.23	[0.36, 1.99]	[0.24, 1.37]
Upper food expenditure bound, *$*	69.61	−14.58	70.72	$71.32	[–32.36, 304.86]	[–120.25, 211.59]
Upper time expenditure bound,[2] *h*	6.41	6.41	5.66	5.66	[–5.0, 25.57]	[–5.0, 25.57]

[1] Summary statistics based on 6331 households.
[2] Values do not vary by L_{TFP} so are the same across L_{TFP} values.

meet the TFP is 8 h/wk but is $100/wk more if this labor requirement is 16 h/wk. Not too surprisingly, actual total cost has a larger SD and a wider 99% percentile interval than the TFP total cost, which means actual consumer behaviors vary greatly from household to household. A comparison of the mean cost shares indicates that the TFP consistent input combination is much more labor intensive than the actual input combination that households choose (i.e. $s_L^{TFP} > s_L^{Actual}$), because we used the same value of labor time in both components. In fact, the cost shares are almost exactly opposite between the TFP and actual total cost. Just averaging between the 2 labor requirement scenarios (i.e. $L_{TFP} = 16$, $L_{TFP} = 8$), the TFP cost share for food is ~40% and for labor is ~60%; this labor cost share is consistent with Davis and You's finding (6). In contrast, the actual cost share for food is ~60% and ~40% for labor.

The mean actual-to-TFP food expenditure ratio indicates that if labor cost is completely ignored, then the mean household more than adequately meets the TFP cost requirement. The mean household spends 34% more in actual spending compared with what is required by the TFP. Alternatively, if labor cost is included, the actual-to-total cost ratio indicates that at the mean households spend 10% less than enough to meet the TFP cost requirement, if the labor required in the TFP is 8 h/wk. If the amount of labor required to meet the TFP is 16 h/wk, then at the mean households spend 40% less than enough to meet the TFP cost requirement. Of course, as is to be expected and as indicated by the SD and 99% percentile interval, there were households for each measure that did spend enough resources to meet the TFP for the total cost ratio, but not at the mean.

Finally, there is likely interest in what is the maximum food expenditure (M_{TFP}^U) or labor (L_{TFP}^U) one could spend, holding the other constant, that keeps the TFP total cost lower than the actual total cost (i.e. $TC_{TFP} \leq TC_{Actual}$). If the labor requirement to meet the TFP is 8 h/wk, at the mean the upper bound on food expenditures is $69.61, but if the labor requirement is increased to 16 h/wk then the mean upper bound must be a negative $14.58. This is to be expected, because as the labor cost increases (with number of hours increasing), the food expenditures must decrease to hold total cost constant. The fact that this upper bound becomes negative reflects the importance of labor cost in the total cost calculations. The 99% percentile interval indicates this upper food expenditure has a rather wide range and reflects the fact that some households may be closer and some farther away from the TFP labor requirement. Perhaps of most interest for policy makers is the upper bound on labor input required by TFP to make the TFP thrifty (i.e. $TC_{TFP} \leq TC_{Actual}$). At the mean, this upper bound is 6.41 h/wk. This means that if policy makers want the input combination that is cost competitive with actual input allocations, the labor requirement for the TFP can be no more than 6.41 h/wk. Note this is over 2 h less than the lower estimate of 8 h/wk implied by Davis and You (6) and is over 10 h/wk less than that implied by the sample weekly menus provided in the USDA document (9). These sizable gaps indicate the need to consider time in intervention and food assistance program designs.

This analysis indicates that the TFP is not very thrifty once labor cost is included. This fact provides a disincentive to adhere to the TFP and the accompanying food guidelines and helps explain why many households do not come close to the dietary guidelines associated with the TFP. Just considering food expenditures in isolation (i.e. ignoring labor cost) can give a very distorted picture in terms of resources adequate to reach the TFP requirement. Though there is certainly some uncertainty with respect to the amount of labor required to adhere to the TFP, the existing estimates indicate that the TFP requirement is very labor intensive and this labor intensity is what drives the results. Future work needs to obtain more precise estimates of the actual labor amount needed to meet the TFP, but, as was shown, to make the total cost of the TFP competitive with actual total cost will require the labor associated with the TFP to be no greater than ~6 h/wk. One simple and practical policy solution is to develop more labor-efficient recipes that satisfy the TFP.

Acknowledgments

We thank Bill Levedahl for numerous conceptual, data, and analytical insights. G.C.D. designed research; G.C.D. and W.Y. conducted research, wrote the paper, and had primary responsibility for final content. Both authors read and approved the final manuscript.

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