

Microcomputer Analysis of Food Consumption Data Using an Electronic Spreadsheet

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Food consumption studies of households or individuals may be carried out through interviews where respondents recall the food items consumed over a period of time. One difficulty faced in such studies is the calculation of the nutrients from the data collected. For researchers who have access to mainframe and minicomputers, calculation of nutrients should not pose much of a problem. Alternatively, software specially written for calculation of nutrients using a microcomputer can be used; a recent issue of the *Journal of Nutrition Education* (Vol 16, No 2, 1984) describes a variety of such programs available in the United States. However, these may be costly and difficult to obtain and may not be compatible with certain brands of microcomputers. More importantly, the food items in such programs are based on the American Food Tables.

For the majority of investigators, therefore, calculation of nutrients may still have to be carried out using conventional hand-held or table-top calculators. There are a number of inherent disadvantages in this method. The amount of calculations needed in, for example, a 24-hour recall study of 50 subjects, each with about 40 types of food items, and 3 nutrients to be calculated from each foodstuff, can be tedious and time-consuming. Moreover, errors in the repeated calculation steps required would be difficult to detect. This note describes the use of a commercially available software package, the spreadsheet (or electronic worksheet), to facilitate the calculation of food consumption data using a microcomputer, as a practical alternative. No technical knowledge of computer programming is required.

The spreadsheet or electronic worksheet is a familiar program to microcomputer users for the purposes of performing accounting and financial analysis tasks. Examples of these programs are Multiplan, Lotus 1-2-3, and the spreadsheets in the more recent Framework and Symphony programs. Formulae can be built into the sheet to enable calculation of a set of input figures to a desired end result. Changing the input figures would enable a rapid re-calculation of the end result. The capability of spreadsheets to answer questions of a "what if?" nature rapidly can be made use of to calculate nutrient quantities from food consumption data. In this case, nutrient quantities are automatically computed each time a new set of food consumption data is keyed in.

Essentially, what is required is to create a master worksheet or template in which all the food items listed in the household questionnaire form are entered, and the formulae required to calculate the edible portion of the foods, as well as the nutrients to be computed, e.g. calorie, protein and fat, are built into the worksheet. Each worksheet could be for the computation of data from one household as shown in the example given (Table 1). The food items have been entered as the first column in the worksheet. The raw data obtained from the study are keyed into the second column. Formulae have been built in to convert

figures in the second column to weight of the food per day (third column) and then as edible portions of the foods (fourth column). Values in the fourth column are then used to calculate the desired nutrients by constructing appropriate formulae, placing the results in columns 5 to 7. A food composition table is of course required. The process is then repeated for all the food items listed using the appropriate factor in the formulae. The cursor-pointing method is suggested for creating the formulae. Formulae in the last row calculate the sum of each of the nutrients in the worksheet. If desired, the recommended dietary allowances (RDA) may be entered, and a formula to calculate percentage RDA built into the worksheet. This shall then be considered a master or template worksheet.

Once created, the worksheet can be easily used by a research assistant. (It is advisable to lock the cells in the worksheet so as to prevent accidental deletion of cell contents, and formulae, by the operator.) The only values that need to be keyed in are those in column 2, the amount of food items consumed by the households as obtained from the study. It is advisable to choose the manual re-calculation option as these data are entered to speed up the process. Once this is done, the appropriate command key is pressed to execute re-calculation. All the values in the rows below columns 3-7 will be rapidly calculated. The new set of values should then be saved under a suitable file name. Accuracy of data entered may be checked on the display or from the printed hard copy.

For successive households, the quantities of foods consumed are entered into the second column. Upon command to recalculate, all the required values will be obtained, based on the new quantities entered. It is important to remember to command the worksheet to recalculate (since the manual recalculation option has been chosen) prior to saving data for each household under a different file name.

When data for all the households have been entered and calculated, the computed nutrient consumption data may be consolidated for the whole community. This can be easily carried out using the copy functions of these programs. Simple descriptive statistical analysis may then be performed on the combined data. Graphs may also be plotted from this data set.

The example given above is for the analysis of household food consumption data. A similar worksheet may also be created and used for the analysis of data from 24-hour recall studies of food consumption of individuals.

An important consideration in carrying out nutrient analysis of food consumption data as described is the amount of random access memory (RAM) available in the hardware since this determines the size of a spreadsheet that may be created. Using Multiplan on an 8-bit micro-computer with 64 KB (kilobytes) of RAM, a worksheet similar to the one described would have used up all the memory available. On the other hand, the sample worksheet shown would have been very comfortably created on a 16-bit system with 256 KB of RAM. Indeed, more nutrients than those given in the example may be included for computation. It should also be borne in mind that the amount of main memory left for use after loading the program depends on the type of software used.

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TABLE I
EXAMPLE OF SPREADSHEET
FOR CALCULATION OF HOUSEHOLD FOOD CONSUMPTION DATA

HH/091	AMT/WEEK (g)	AMT/DAY (g)	E.P. (g)	ENERGY (Kcal)	PROTEIN (g)	FAT (g)
RICE	2400	343	343	1197	24.0	1.7
RICE FLOUR	300	43	43	160	2.6	.4
WHEAT FLOUR	1800	257	257	887	33.7	4.1
BUSCUIT	1000	143	143	583	12.6	12.0
BREAD	300	43	43	110	3.7	.3
TUBER	11778	1683	1514	2453	0	0
SUGAR	3000	429	429	1706	0	0
OIL	3000	429	429	3857	0	428.6
MEE	1200	171	171	355	7.7	1.4
KUEH-TIAU	0	0	0	0	0	0
DRIED MEE	255	36	36	132	6.4	1.3
MEE HOON	600	86	86	302	9.7	0
CONDENSED MILK	1191	170	170	575	15.5	15.1
SUM/1				12315	115.77	464.87
FRESH FISH	12000	1714	1029	1111	199.5	26.7
DRIED FISH	75	11	11	18	3.8	.2
DRIED ANCHOVY	300	43	43	111	24.3	1.6
SARDINE	850	121	121	11	22.8	22.0
PRAWN	2400	343	171	168	25.7	6
COCKLES	1000	143	43	20	3.4	.4
EGG	500	71	64	107	8.6	8.0
BEEF	250	36	36	82	5.4	6.7
CHICKEN	2000	286	200	294	44.6	12.8
MUTTON	0	0	0	0	0	0
DUCK	0	0	0	0	0	0
PORK	0	0	0	0	0	0
LEGUMES	600	86	86	282	18	.1
GROUNDNUT	300	43	43	256	9.3	20.7
TAU-KUA	300	43	43	130	12.3	11.9
TAU-HOO	1000	143	143	124	15.3	4.6
POWDER MILK	0	0	0	0	0	0
SUM/2				2714	392.98	121.73
SPINACH	7000	1000	870	235	22.6	2.6
MUSTARD LEAF	0	0	0	0	0	0
LONG BEAN	0	0	0	0	0	0
BEAN SPROUT	0	0	0	0	0	0
SWAMP CABBAGE	0	0	0	0	0	0
BANANA	0	0	0	0	0	0
PAPAYA	0	0	0	0	0	0
APPLE	0	0	0	0	0	0
ORANGE	1200	171	99	52	.7	.5
SUM/3				287	23.3	3.1
SUM				15316	532.1	589.7

Another important consideration is the amount of storage capacity in the hardware. On an 8-bit system with 128 KB in a disk drive, and using Multiplan, about 15 worksheets similar to the one described may be stored. On the other hand, also using Multiplan, 20 such worksheets may be stored in a 320 KB drive in a 16-bit system. Thus multiple diskettes would be required for 100 households studied. If a hard disk (fixed disk) of, say, 10 MB is available, the task of storing all these multiple files would be simplified. The number of worksheet files that may be stored in a diskette would also depend on the type of spreadsheet used. The size of the spreadsheet created should be checked to determine the number of such sheets that may be stored on a disk.

In the example given in this paper, each worksheet handles the data from only one household. As pointed out above, only this format may be accommodated on an 8-bit system. If a 16-bit computer with a large memory is available, one might also wish to consider having a huge worksheet to accommodate several households in one worksheet. The procedure to create such a worksheet is similar to the one described for one household. One advantage in having a single worksheet with data for multiple households is that it reduces the number of files needed to save all the data. Of greater importance is that with such a worksheet it is easier to combine the computed nutrient consumption for all the households in the study.
