NUTRIENT ANALYSIS PROGRAMS: CONSIDERATIONS FOR EDUCATIONAL SETTINGS

Suzanne Pelican
Nutrition Education Center
The Pennsylvania State University
University Park, PA

I am here as a nutrition educator to offer some thoughts on the use of nutrient analysis programs in educational settings. At the outset, I hope that we can all agree that (1) there has been a rapid increase in the number of nutrient analysis programs used for educational purposes, and (2) it is important to ask - and to answer - the question, "What do people learn from nutrient analysis programs?"

As a framework for discussion I have compiled a brief outline consisting of four "considerations" for educational settings: (1) program purpose(s), (2) accuracy of information, (3) program usability, and (4) evaluation. These factors are, in my opinion, critical to the "educational success" of nutrient analysis programs. As I expand on this outline of four considerations, I am ultimately building the case that educationally, a computer program needs to be part of a larger educational format with special support materials.

To discuss these four outline points with a broader base than just my exposure to a few programs, I conducted an informal survey and sent questionnaires to 34 individuals who serve as contact people for nutrient analysis programs. Two points require clarification here. First, throughout the country there are many more than 34 programs being used in educational settings. I simply sent questionnaires to request information on all programs that I was able to identify through informal channels as being used in educational settings. The second clarification is of my use of the word "educational." Of the 14 questionnaires returned, a few programs were used for research purposes only. The remaining programs had been used to educate patients, nutrition students, and/or the lay public. In this presentation I am going to focus on lay public or consumer education uses and on those eight programs which were identified through the survey questionnaires as being used in consumer education settings, i.e., settings such as weight reduction classes, health fairs, high school classes, etc.

As a preface to discussing the first outline consideration - program purpose - I need to clarify one of my personal concerns: the use of nutrient analysis programs as "diet" analysis programs. Nutrition professionals are acutely aware of the problems involved with inferring long-term eating habits from short-term food intakes. Yet most analysis programs are promoted as "diet" analysis. This is a serious error that could lead, for example, to consumer self-prescription of vitamin/mineral supplements. I consider this type of action a great misuse of program information. As educators, we may add the qualification that a printout "is a diet analysis only if the intake is representative of daily eating patterns." But this shift of responsibility to the learner is hardly a fair one because we provide no guidelines to assist a learner in determining this "representativeness." In fact, that is the crux of the problem that nutritionists have faced for so long. Educationally, therefore, I maintain there are hazards in promotion of programs as providing "diet" analyses.

Program purpose(s)

Four commonly stated purposes are the following: (1) to increase learner awareness of foods consumed; (2) to analyze sample food intakes; (3) to generate a printout which is used as a nutrition education tool; and (4) to provide learners with a positive, rewarding experience with a computer. The first common purpose, increased awareness of food consumption, can result from recalling foods previously consumed and possibly, from coding food item names for submission into the computer. The second purpose, analysis of a sample food intake, is shared by virtually all of the programs, but again, in conjunction with the concern over "diet" analysis, what do we expect a learner to do with a printed analysis of a sample food intake? In contrast, the third purpose, the generation of a printout used as a nutrition education tool, implies that the computer program is part of a larger educational program or learning situation, and that distinction is an important one. Providing learners with a positive, rewarding experience with a computer is certainly not a nutrition education purpose, but this fourth purpose allows interactive nutrient analysis programs to play a role in the computer education field.

Accuracy of information

Before turning to this second consideration, please let me note why I did not address "accuracy" first. Certainly, a program which provides inaccurate information is less than worthless; it becomes counterproductive. But too often we dive into developing an accurate program without establishing why we developed it in the first place. Therefore, "purpose" is the first consideration in time, followed immediately by "accuracy" because accuracy is critical to any educational program. I also stress that I am using the term "accuracy" in a broad sense. I will address the obvious meaning, that is, correct data and correct use of the data by the computer program, but I will also use the term in a broader sense to include completeness of data and interpretation of some aspects of the data analysis by learners.

Data base(s). Looking first at data base accuracy, I will comment here only on nutrient data bases, but the ideas are applicable to other data bases that may enter into an analysis, e.g., energy expenditure data. At least three characteristics contribute to accuracy of nutrient data: whether the data are from a legitimate source, if the data are current, and if the data are complete. I will address each of these individually.

In terms of the primary sources of nutrient data for the survey programs, six programs reported using USDA data directly, one program uses its university's data base, and one program uses the reference by Pennington and Church. Certainly, the latter two programs ultimately draw a large amount of data from USDA, but the important point to note here is that all of the survey programs appear to use data from legitimate sources.

Turning to whether the data are current, only one program that uses USDA data indicated that it is incorporating the data out of the supplementary handbooks currently being generated by USDA. Although all programs are not set up to incorporate this new data, it does bring up the point that there is a time factor involved in accuracy of nutrient data. What were accurate data in 1972,

are not necessarily accurate in 1982, and this discrepancy is due, of course, to improvements in assay techniques and the changing food supply. One of my greatest concerns (which is shared by other people as well) is in this area of updating accuracy, and it centers on nutrient analysis software programs being developed and sold with no update provisions. I would venture to say that virtually all lay people and a surprising number of nutrition professionals believe that nutrient data is exact and relatively unchanging. Consequently, nutrition educators must acknowledge their responsibility to convey to people - regardless of whether they are obtaining a single nutrient analysis printout at a health fair or purchasing an entire program for use in their home - that nutrient data is dynamic and in order for it to be accurate, nutrient data banks require periodic revisions.

The third factor contributing to data accuracy is completeness of data. If you visualize a nutrient data bank in a tabular form in two directions, the horizontal can represent the range of nutrients and the vertical can represent the range of food or dietary items. I will comment in a few moments on the completeness of data in the horizontal direction, i.e., nutrient data, but for now, I would like to consider completeness of the data in the vertical direction, food or dietary item selection. Item selection affects accuracy to the extent that a learner may have to substitute one item for another when items look similar, but are quite different nutritionally. For example, if a person recalls eating a bowl of Product 19 cereal, the printed analysis would look very different if Product 19 were not in the data bank and the person coded, instead, a cereal such as bran flakes which looks similar to Product 19 but is not as highly fortified. Of the eight consumer survey programs, seven include name brand breakfast cereals and name brand fast foods. These two categories are not the only ones to consider in terms of item completeness, but they certainly are key categories. In other words, they contain many commonly consumed items for which substitutions may create large errors and, therefore, contribute to inaccurate information being provided to a learner.

Learner input. This second factor which contributes to accuracy of information involves the quality of the information provided by a learner. It is an obvious fact that the accuracy of the output depends on the accuracy of the input. Even though we acknowledge that principle, there are times when we may overlook it, and often we fail to convey the principle to learners. The problem boils down to the fact that anyone can succumb to the mystique of computer generated information, namely, that once information has been printed by a computer, it has somehow become correct.

There are two main points to consider in this area of learner input. The first is whether or not a learner's recall or record is accurate. Obviously, this involves the complete listing and correct estimation of all food items, but it also applies to other information such as activity level estimates which are used in some programs. Misestimations of physical activity levels are probably quite common. The second point contributing to accuracy of learner input is whether the input information is coded and submitted correctly. Coding and submission errors are easy to make and often difficult to detect. Therefore, it is important for a program to provide a system which allows a learner to verify by name - not just by code number - what items have been analyzed.

Printout. Turning to how the output contributes to accuracy, the first point is the verification that the data base has been used correctly so that the program prints correct calculations. This point may sound obvious but depending on a program's size, it may take many different analyses to test all program pathways.

A second point involves whether or not the printout reflects "holes" in the nutrient data bank. I commented before on the vertical completeness of data, i.e., the selection of food or dietary items. Here, I am referring to the "horizontal" completeness, that is, for how many foods does the data base have complete nutrient values? Missing data is not necessarily bad and sometimes is, in fact, unavoidable, but a printout needs to indicate where values are missing. For example, in a program that has vitamin B_{12} values for some but not all foods, a consumer needs to know if a low total B_{12} intake shown in a printout is based on some or on all of the foods consumed. Otherwise, the person will likely assume that the intake was lacking, and that will be a false assumption if the low value was actually due to an incomplete data base. "Flagging" of missing data is done most meaningfully if the printout shows an analysis of each food individually. However, even if only total nutrient values appear on the printout, a total value can still be flagged to indicate incomplete data. Of the eight survey programs, three apparently have no missing data; of the remaining five programs with incomplete data, none flag missing data.

Learner interpretation. This last point contributing to accuracy of information has many different aspects, but I am going to comment briefly on learner interpretation of intake comparison standards (specifically, the RDA) and of dietary suggestions since these are common to many consumer education programs. Indeed, all eight programs from the survey compare intake totals to the RDA and all provide some type of dietary suggestions. Learner interpretation of the RDA is an area of concern I share with some colleagues at Penn State. On the basis of an informal study, we observed that even with a written explanation of the RDA, elderly lay people still did not understand the concept. I am certainly aware of the controversy over using the RDA for comparison to individual intakes, but as an educator I also know how difficult it is to teach without using a standard. The controversy will not be quickly resolved, but I would maintain that for comparison information to be considered truly accurate, learners need to understand the basis of comparison, whatever that standard is. In other words, if we use the RDA for comparison, we need to devise a way to explain the concept.

Including "learner interpretation of dietary suggestions" under the umbrella of "accuracy" may stretch the limits of the word's meaning in some people's minds. But it is this aspect of nutrient analysis programs which may be fostering a great deal of misunderstanding by learners, and therefore, inaccuracies. We need to have some idea of whether learners understand the dietary suggestions, if learners use the information from the suggestions, and if they use the information in the way that was intended by the individuals who developed the program. I think that with some investigation, we would find some discrepancies in these areas.

Educational Support Materials. On this note of possible learner error, it is appropriate to turn to the subject of educational support materials and consider two factors in the area of accuracy - *learner input and learner interpretation* - which necessitate some type of guidance. Of the eight survey programs, seven provide some type of input guidance related to recording, recalling, or coding food items. Of those seven programs, four provide printed guidance and three provide only verbal assistance.

In terms of output guidance which assists a learner in understanding the printout, all of the survey programs provide some type of guidance. Five provide it in printed form, and three provide only verbal assistance.

Standardizing guidance in some printed form is a good idea. Three examples of printed output guidance from the survey programs include an explanatory brochure, a booklet, and a slide/cassette tape resource. Although I have only three examples of support materials, it is these types of resources which are essential for a computer program to be usable in educational settings, or for a computer program to become an educational program.

Program usability

The third major consideration for educational settings is loosely termed program usability. The points may appear to fit better under "accuracy" or "evaluation" but I want to mention them briefly yet separately in the context of usability with different audiences. Very simply, it is a mistake to assume that if a program is usable with one group, it is usable with all audiences. Two points (and by no means the only two) to consider in terms of target audience are readability of the printout and clarity of support materials. What is readable and clear to one audience may be of little value to a different group.

Evaluation

The fourth consideration in educational settings is evaluation, which includes evaluation of physical program components as well as of educational or learner objectives. Some aspects of evaluation have already been mentioned with other considerations, but I think that it is imperative to consider evaluation separately because it is this area that has the potential for answering with greatest certainty the question, "What are people learning from nutrient analysis programs?" Evaluation is also the area in which the least has been done from an educational standpoint, as far as I have been able to determine. Only one of the eight survey programs has attempted formal evaluation of its educational support materials. Three programs have conducted affective evaluations of learners' reactions to the program, but as far as I know, only one of the eight programs has conducted a formal evaluation of the program's effect on nutrition knowledge of learners. Therefore, I would say that we do not know what people are learning from these programs. We obviously have some educational challenges ahead of us.

In looking toward this future work, I would like to close with two final thoughts. First, with no offense to Marshall McLuhan, the medium is not the message, and as a corollary, computers and computer outputs do not communicate. These are tools used by people who communicate through creatively written programs in conjunction with appropriate support materials. The second thought is that we need to free our imaginations from having to think that the only use for nutrient data is analysis of a person's food intake from yesterday, or the past three days, etc. It strikes me that with the vast amount of nutrient data available and with keen imaginations, we could create many different kinds of nutrient analysis programs which could be valuable in a variety of educational settings.

I will end by repeating a previous statement: We obviously have some educational challenges ahead of us.