

ANALYSIS OF UTILIZATION OF PARTIAL
FACTOR PRODUCTIVITY MEASURES FOR
TRAYLINES IN HOSPITAL
FOODSERVICE

By

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When you come to the edge of all the light you have, there will be something solid to stand on or God will teach you to fly (Ron Lewis).

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Scope and Method of Study: Productivity is currently a "buzz" word in management, but research in productivity measurement in foodservice organizations has been scarce. It is inevitable that productivity increase if the foodservice industry expects to become and/or remain profitable without depending on price recovery. The present study identified partial factor productivity ratios and other measures, through the use of a participative group strategy. Management dietitians provided data on which measures were currently being used, which were perceived as useful, and which were most important in monitoring productivity in health care delivery systems.

Findings and Conclusions: Results indicate that dietitians utilize cost trends and indicators much more often than the measures presented in the study. There are, however, significant differences in ratios used, perceived as useful, and ranked most important by dietitians based on selected personal and institutional variables. The identified measure most frequently used is the productivity ratio patients fed (midnight census)/labor hours. The measure perceived as the most useful is patient satisfaction (food temp)/delivery time. This study illustrates that each segment of the foodservice organization can be measured. It also provides an example of opportunities available to foodservice managers and dietitians to monitor many aspects of productivity in their systems.

It was also found that the dietitians have limited knowledge of productivity measurement, but do perceive it as important. Dietitians need to develop productivity measurement and improvement programs for their specific operations. If they do not take the initiative to perform productivity programs, other groups which are not familiar with foodservice may take this action, forcing inappropriate measures upon the industry.

ADVISER'S APPROVAL

Lee L. Ebers

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CHAPTER I

INTRODUCTION

Gradually decreasing productivity growth in the United States is paralleled with increasing productivity growth in Japan, spreading concern for America's ability to compete in the world market (Thurow, 1980). Drucker (1980, p. 18) states the following: "Nothing is as dangerous as a decrease in productivities. It makes a shrinking of the economy inevitable. It creates inflationary pressures, social conflict, and mutual suspicion."

Serious national problems could result if, indeed, this country's long-term standing has been jeopardized.

The growth rate of labor productivity in the whole U.S. economy fell from 3.2 percent per year in the 1947-65 interval to 2.4 percent annually in 1965-73. In the 1973-79 period, U.S. labor productivity growth had declined to an average annual rate of 0.8 percent (MacDonald, 1981, p. 24).

Thus, the "productivity scare" has begun. Literature written in the 1970's is full of suggestions for productivity improvement although appropriate definitions of productivity are not present in that literature. There is, therefore, much controversy and public confusion in this area. Everyone wants high productivity, but what is it?--how is it measured?--and how can it be improved?

As research in the area of productivity increases, greater consistency in the literature will be evident. As knowledge increases, productivity measurement and improvement programs grow more structured and

beneficial, enabling many corporations to develop programs of their own.

To date, however, there has been no standard productivity measurement system that foodservice management may use to evaluate and improve performance. Klein (1978) mentions the importance of administrative dietitians taking the initiative to make recommendations of measurement and improvement techniques. If this action is not taken by dietitians, groups not familiar with the variables in foodservice may try to force inappropriate measures upon the industry.

The foodservice industry in general and foodservice systems in health care and other institutions continuously face increasing production and quality demands as well as rising labor costs (Ostenso & Donaldson, 1966). Yet there has been no trend toward an increase in labor productivity in foodservice systems since 1955 (Zolber & Donaldson, 1970). Kotschevar (1972) reported that labor in the foodservice industry produces about 47 percent of the time, whereas a more normal productivity rate is 80 to 85 percent. In fact, productivity has been decreasing at a rate of approximately one percent per year while labor costs, which sometimes exceed food costs (Waldvogel & Ostenso, 1977b), have been rising five percent in the food industry (Woolley, 1964). Obviously the demands are not being met.

There is less opportunity for automation in service organizations than in industry; therefore, another way to increase productivity is necessary (Kent & Ostenso, 1965). Further research is needed for development of a measurement and improvement system. That system should provide information for more effective utilization of labor resources, which is necessary to maintain an optimum balance between food and labor expenditures (Ostenso & Donaldson, 1966). The foodservice industry

must learn to measure and improve its productivity if it expects to remain profitable without depending on price recovery. Results of this study could increase the productivity awareness of dietetic practitioners.

Purpose and Objectives

The purpose in this study was to identify partial factor productivity measures which could be utilized by dietitians with management responsibilities in health care delivery systems as "guide(s) to productivity improvement and . . . to monitor improvement efforts" (Stewart, 1980, p. 6). Specific objectives for the research were the following:

1. Identify types of partial factor productivity measures (ratios) utilized in hospital traylines.
2. Identify partial factor productivity measures perceived as useful for hospital traylines.
3. Identify the five most important partial factor productivity measures for hospital traylines.

Hypotheses

The hypotheses for this research were as follows:

H_1 : There is no significant difference in the partial factor productivity measures (ratios) utilized by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables:

- a.) position title
- b.) years of ADA membership
- c.) route to ADA membership
- d.) level of education

- e.) hospital control
- f.) services provided
- g.) hospital size
- h.) foodservice management
- i.) type of foodservice system
- j.) tray delivery
- k.) number of traylines/galleys
- l.) number of trayline supervisors
- m.) number of dietary hostesses
- n.) means of diet change communication
 - 1.) cathode ray tube
 - 2.) telephone
 - 3.) memo
 - 4.) intercom
 - 5.) chart
 - 6.) hostess
 - 7.) nurse
 - 8.) pneumatic tube
 - 9.) infolink or electrowriter
- o.) time of patient census
- p.) patient satisfaction evaluation
- q.) training program
- r.) tray service evaluation
 - 1.) cost trends
 - 2.) cost/revenue
 - 3.) indicators
 - 4.) indexes
 - 5.) productivity ratios

H₂: There is no significant difference in the partial factor productivity measures (ratios) perceived as useful by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables (same variables as in H₁).

H₃: There is no significant difference in the partial factor productivity measures (ratios) perceived as one of the five most important by dietitians with managerial responsibilities in health care delivery systems based on selected personal and institutional variables (same variables as in H₁).

Assumptions and Limitations

The assumptions which had an impact on the outcomes of the study were as follows:

1. Dietitians surveyed had enough knowledge of partial factor productivity measures to objectively respond to the questionnaire.
2. Dietitians surveyed were employed in health care delivery systems with similar traylines.
3. Dietitians surveyed utilized a group process with trayline personnel to derive or identify partial factor productivity measures and to achieve a consensus of the most important measures. It was further assumed that the consensus reflected the respondents' (dietitians') beliefs and attitudes regarding trayline service.

The following limitation was identified and accepted for the study:

1. Membership in the ADA practice group "Dietitians with Responsibilities in Health Care Delivery Systems" was not mutually exclusive.

Definition of Terms

The following terms were utilized in this study:

American Dietetic Association (ADA)--"A professional organization responsible for establishing educational and supervised clinical experience requirements and standards of practice in dietetics" (ADA Reports, 1981, p. 66).

Cost/revenue--specific or total costs incurred by the operation/partial or total income received by the operation.

Cost trends--the tracking of certain costs of the operation over time.

Dynamic measurement--"using a ratio of output measure(s) for two points in time to a ratio of input measure(s) for two points in time" (Sink, 1980a, p. 3).

Effectiveness--"reaching a mission or a planned achievement or a needed value without serious regard for the costs incurred in the process" (Mali, 1978, p. 6).

Efficiency--how well resources are brought together, "achieving results with minimal expenditures of these resources" (Mali, 1978, p. 6).

Hostess--person (other than the dietitian) who carries the menus or visits the patients.

Index--number used to indicate a change in magnitude of some measure as compared with the magnitude at some earlier specified time.

Indicators--significant factors in the organization which are recorded to express improvements or problems.

Input variable--"any of the controllable and varying factors or resources which may be acquired in various quantities, types, and/or

qualities (i.e., energy, people, materials, data, etc.)" (Sink, 1980a, p. 3).

Outcome variable--"the result(s) of selling and delivering the output variables to persons/organizations in the environment of an organization" (Sink, 1980a, p. 2).

Output variable--"any of the controllable and varying factors or resources which are resultant from the transformation of the input variables" (Sink, 1980a, p. 2).

Partial factor productivity measurement--only includes "certain output and input measures in the ratio" (Sink, 1980a, p. 2).

Practice groups--Defined groups of at least 50 dietitians who are employed in or have declared interest in a specific area of dietetic practice. Members indicate their voluntary alignment with a group and pay dues once per year to maintain active membership.

Process or transformation--"a transforming of the form, outward appearance, condition, nature, function, personality, character, etc., for applicable input variables" (Sink, 1980a, p. 2).

Productivity--"Relationship between some measure or measures of output to some measure or measures of input" (Sink, 1981a, p. 7).

Productivity improvement--"the result of managing and intervening upon key transformations" (Sink, 1980b, p. 1).

Productivity management--"Planned, systematic manipulation or control of critical input variables in response to the results of the transformation process (the outputs) as measured and compared in ratio to those same input variables" (Sink, 1980a, p. 3).

Productivity measurement system--assists management in determining the degree of goal attainment which results from organizational performance over some period of time (Stewart, 1980).

Profitability--"margin between total revenues and total costs"

(Sink, 1980a, p. 3).

Static measurement--"using measures(s) reflecting a point in time"

(Sink, 1980a, p. 8).

Total factor productivity measurement--includes "all output measures and all input measures in the ratio" (Sink, 1980a, p. 3).

Unit of analysis--"refers to the scope of the system being assessed"

(Sink, 1980a, p. 3).

CHAPTER II

REVIEW OF LITERATURE

A review of the literature which was pertinent to the study is included in this chapter. An understanding of organization development and change strategies would be essential for the operationalization of a study such as this. Knowledge of productivity was also necessary in accomplishing the objectives set forth. Productivity measurement in foodservice organizations was reviewed in order to see what has been accomplished in the development of a standard productivity measurement system.

Conceptual Overview

Organization Development

A constantly fluctuating market and product make it virtually impossible for a business organization to survive without changing to meet new needs. Organization development

Is a response to change, a complex educational strategy intended to change the beliefs, attitudes, values, and structure of organizations so that they can better adapt to new technology, markets, challenges, and the dizzying rate of change itself (Bennis, 1969, p. 2).

Although organization development is not a solution in itself, it enables managers to work through their problems. This continuing process requires that managers perpetually reexamined procedures for compatibility with the changing environment (Strauss & Sayles, 1980).

Change Strategies

Burley (1976, p. 3), a foodservice consultant, reminded foodservice researchers that "to achieve improved productivity actual changes in practices, attitudes, and procedures in the habits of people and institutions are required." "Changes in a system, when they are reality oriented, take the form of problem solving" (Bennis, Benne, Chin, & Corey, 1976, p. 34). Benne and Chin define four types of strategies that may be used to cause change. This research utilized the normative-re-educative strategy.

Normative-re-educative approaches to effecting change bring direct interventions by change agents, interventions based on a consciously worked out theory of change and of changing, into the life of a client system, be that system a person, a small group, an organization, or a community (Bennis et al., 1976, p. 32).

Morris (1979, p. 35) lists certain preconditions that must be recognized before change can take place.

1. Change will occur when clients accept the need for it, make their own decisions in favor of it, and determine for themselves the directions it will take.
2. The most effective way to encourage change is to make the client a collaborator or co-worker in the process. Change is most likely to occur when it is primarily a process of self-awareness and self-direction.

These strategies emphasize the client's role in working out change programs for himself (or itself). But at the same time, the change agent mediates jointly with the client in order to assist him (or it) in defining and solving the problem. The idea is that people technology is as important as thing technology to implement some types of desirable changes (Bennis et al., 1976).

Productivity

The term productivity has been interpreted negatively in the past because the word left connotations of speeding up and working harder (Sink, 1978). But Mali (1978, p. 6) defined productivity as

. . . the measure of how well resources are brought together in organizations and utilized for accomplishing a desired set of results. Productivity is reaching the highest level of performance with the least expenditure of resources.

Hamlin (1978, p. 223) also expressed a positive definition when he stated that productivity could and should result in a

better quality of working life, higher wages, increased standard of living, more profits and capital, price stability, promotion of our market system, better products, and greater social benefits for society.

Simply stated, productivity is the relationship between quantities of output to quantities of input.

Productivity Measurement

"Productivity measurement is the process by which we select the outputs and inputs to develop ratios and eventually standards" (Sink, 1980a, p. 1) to use as valuable management tools. Mali stated that productivity could and should be quantified for evaluative purposes. It could be

comprehensive or selective in coverage, tailored or generalized to the needs of the organization. The organization should choose to select its form of evaluation with the aim of assessing the amount of productivity change over time (Mali, 1978, p. 8).

Ratios used to measure productivity may be compared from one time period to another within an organization, department, or function.

Changes in the ratios can result from changes in practices, new technology,

or a change in labor or quantity produced ("Validating an Instrument," Unpub).

If productivity does not increase enough to absorb rising wages and other costs, then either prices rise or profits fall (Young, 1981). Productivity, then, is one of the main factors in competition between businesses. For example, if two companies offer similar products, costs and prices are probably also similar. Therefore, if one company grows faster than the other, it must be more effective and efficient due to higher productivity.

Why Measure? When a manager looks at his firm's accounting records and sees a satisfactory profit, he might assume that the organization is efficient and well run. With added information on productivity, however, some managers realize that the old measurement system does not necessarily indicate high productivity. A new system is needed to relate quantities of outputs to quantities of inputs.

By analyzing a good productivity measurement system, one can see whether the best mixture of labor, capital, and materials is present to create the desired output. If these figures are compared over time, management can determine when improvements occur or when they need to be made--thus, the potential exists for control of productivity. The quantitative feature also "helps us see the effects the results will have on other areas" and "increases the rationality of decision making and managing" (Mali, 1978, p. 81).

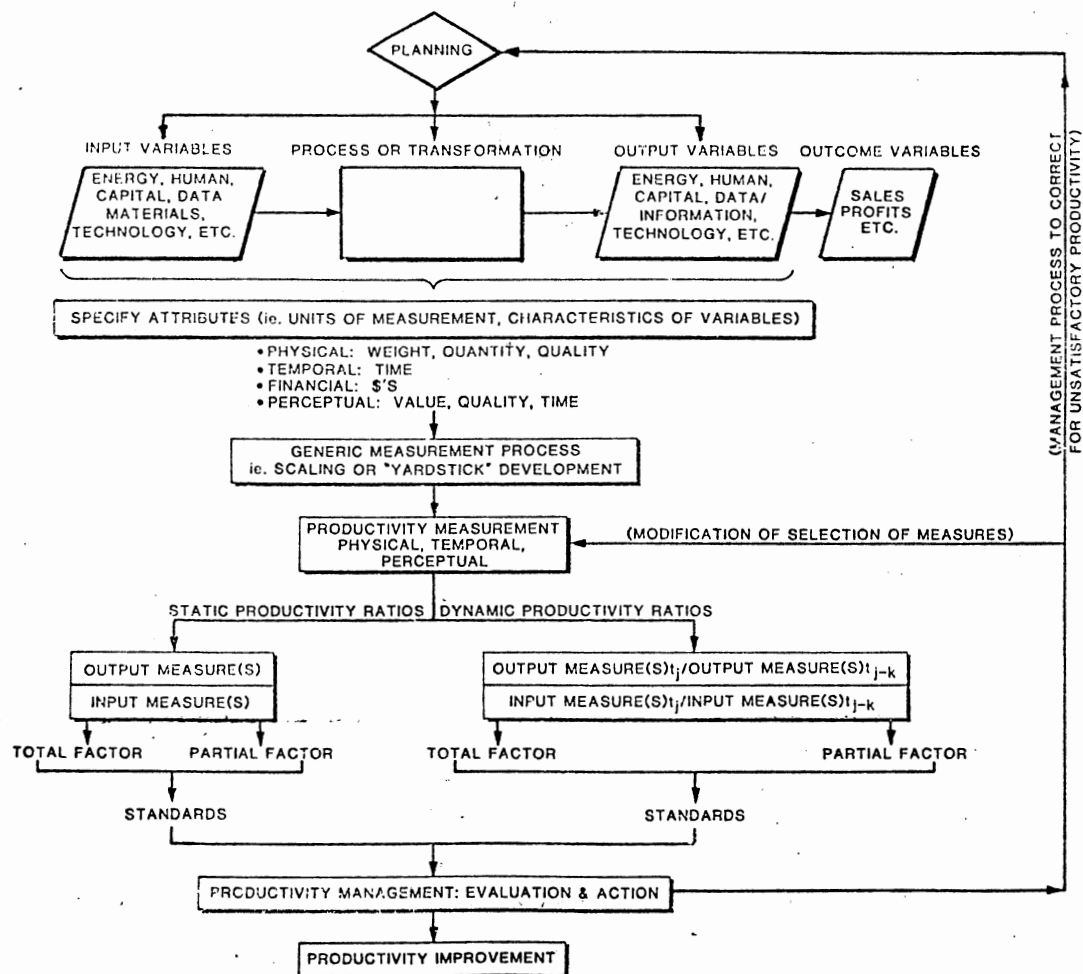
How to Measure. To develop a productivity measurement system, one must realize that each organization is unique and that the system must be suited to it specifically. First, top management must want and

understand the need for the program before it can be effective. Management has valuable information and can encourage others to use the program. When management understands the need for the program, the decision of who will decide what to measure and how to measure must be made. Top management, supervisors, other various committees, or a consultant may be chosen to complete the measurement process.

Those involved must then determine the unit of analysis to measure. The entire organization may be measured or only a certain part, i.e., store, department, or function. That decision must be consistent throughout each particular measurement.

The next decision is which measurements to include. Productivity may be measured by using different amounts of information. Total or partial measures may be calculated either statically or dynamically depending on the individual organization or unit of analysis being measured (Figure 1). Figure 2 describes how these measures are calculated. It is important to obtain the correct blend of information on the outputs and inputs in order to create a representative picture of what is actually taking place in that unit.

To analyze the productivity of an entire unit of analysis, one must perform a total productivity measurement by which all the outputs are related to all the inputs. By measuring the total organization, one can see whether it is productive overall. But specific unproductive areas may go unnoticed. Militzer (1980, p. 2) states that macro productivity ratios have not "proven very useful in achieving improvements in productivity growth." Therefore, it may be difficult to find possibilities for improvements with that unit of analysis.



Source: Sink (1980a), p. 2.

Figure 1. Productivity Management: General Systems Model of Measurement and Improvement

	<u>Static</u>	<u>Dynamic</u>	
Total Factor Productivity	$\sum_{i=1}^n O_i$	$\sum_{i=1}^n O_{i,j}$	$\sum_{i=1}^n O_{i,j-k}$
	$\sum_{i=1}^n I_i$	$\sum_{i=1}^n I_{i,j}$	$\sum_{i=1}^n I_{i,j-k}$
Partial Factor Productivity	$\sum_{i=1}^p O_i$	$\sum_{i=1}^p O_{i,j}$	$\sum_{i=1}^p O_{i,j-k}$
	$\sum_{i=1}^p I_i$	$\sum_{i=1}^p I_{i,j}$	$\sum_{i=1}^p I_{i,j-k}$

where: j = some period or point in time

k = some period or point in time prior to j

n = the number of input or output variables

$p \leq n$

Source: Sink (1980a), p. 3.

Figure 2. Alternative Productivity Ratio Development

In partial productivity measurement, one or more specific outputs and inputs of the unit of analysis are selected to measure. To help in making the decision of what to measure, all inputs and outputs may be listed. Then, items of special importance may be selected from the lists. These measures are helpful in deciding exactly where improvements are possible.

Productivity Improvement

After development of the measurement system and calculations of ratios, the real work begins. One must analyze the measurements to determine if they provide the desired information. The measurements should indicate which areas are opportunities for improvement. It may be necessary to involve people in the organization being studied in order to gain insight as to what the problem is and how it can be solved.

A participative method often works well. A structured group process can identify problems, determine priorities, and find solutions. By using a systematic approach with participation, group wisdom develops and the group becomes committed to improvement because of their involvement.

Productivity improvement is the result of "managing and intervening upon key transformations or work processes." Sink (1980b, p. 1) states that productivity improves if:

1. Output increases, input decreases, $O\uparrow/I\downarrow$
2. Output increases, input constant, $O\uparrow/I-$
3. Output increases, input increases
but at a lower rate, $O\uparrow/I\uparrow$
4. Output constant, input decreases, $O-/I\downarrow$

5. Output decreases, input decreases
but at a more rapid rate.

O↓/I↓

Drucker (1980) and Sink and Mize (1981) recognized the necessity of a planned, deliberate program of change directed at improving every facet. The most conspicuous and controllable of various inputs, however was labor. Newburn (1972, p. 656) stated that increased productivity resulted "more from the efficiency with which labor is used than from the efficiency of the labor itself." Studies indicated that 35 percent of productivity loss was due to poor planning and scheduling, and that 25 percent was because of unclear or untimely instructions to employees (Industrial Engineering Newsfront, 1980).

Kotschevar (1972) stated that the responsibility for productivity was not the workers'. He suggested that management create a situation which would help workers increase their productivity rate. Mali, (1978, p. 14) stated that the "Employees must be thought of as investments in human resources." Rosow (1977) also emphasized that to increase productivity, human resource management required more attention than it had previously received, and technology required less.

Brimeyer and Sink (1979) gave this attention to human resource management in their action research, which developed and implemented a productivity measurement and improvement program for city service workers in Ohio. Top management commitment was obtained and employees took part in a structured group process. Problem areas in productivity emanated and solutions and improvements in productivity became evident.

If one makes the correct changes, identifiable improvements and cost reduction should occur. And most importantly, a concept of what good productivity is and how it is obtained and retained should arise. If these result, that organization should continue to steadily progress.

Productivity in Foodservice

An early study which showed labor time in relation to meals served occurred in 1929 (Western Washington Dietetic Association, 1934). Other studies on the subject were scarce until the 1950's. During that decade, labor time seemed to be of major importance in the literature. In the 1960's there was a surge of work measurement used to evaluate performance of individuals and set productivity time standards. Researchers concentrated on work sampling because it was the only measurement useful for an overall view of the operation. Time study (Coffey, Spragg, McCune, & Gordon, 1964), time and motion (Mundel, 1956; Smith, 1972), predetermined motion times (Brown, 1969, Matthews, Waldvogel, Mahaffey, & Zemel, 1978; Montag, McKinley & Klinschmidt, 1964; Waldvogel & Ostenso, 1977a, 1977b), and conceptual estimation (Brown, 1972; Lebeau, 1976) were other types of descriptive survey research used to measure work in foodservice.

This research did not use work measurement, but Appendix A contains a short review of those methods in foodservice. One can see that most of those measures are minute and deal primarily with work on the individual level. The present research was more concerned with productivity measurement of the group or department.

Finally, in the 1970's, productivity regained importance in the foodservice industry. It was used to measure the performance of a group, department, or organization. People realized the necessity of research to improve foodservice productivity, but first those in control of foodservice systems had to define, measure, and analyze productivity.

Although most foodservice employers understood the need for productivity improvement, few had chosen methods of measuring it. "The

development of meaningful productivity measurement is important so that periodic reports of labor productivity can be compared with predetermined goals" (Stokes, 1981, p. 7). Many foodservice managers misunderstood this concept, and poor determination of labor requirements and levels of performance caused financial collapse of foodservice businesses (Freshwater & Bragg, 1975). For a long time this industry tolerated low productivity and used price recovery as a substitute for productivity in order to survive (Sink, 1981b).

Existing Ratios

The recognition of productivity in the foodservice industry encouraged the formulation of ratios to measure productivity. Although productivity was defined as 'output/input' (O/I), many foodservice organizations continued to use the work measurement ratios of 'labor hours/100 customers' or 'minutes/meal' (Blaker & Harris, 1952; Brown, 1972; Donaldson, 1957; Freshwater & Bragg, 1975; Halter & Donaldson, 1957; Maclean, 1975; Ostenso & Donaldson, 1966). For establishment of a standard productivity measurement, implementation of the definition of productivity was necessary.

Several researchers followed the definition of output over input but made one other major error by measuring output with dollar values instead of with quantities produced. Dollar values were not adequate as a sole productivity measurement because of the instability of the dollar and constant variance of costs incurred and prices charged. These factors were not related to how productively work was accomplished. Studies using this "wrong" index abounded in the literature. Profitability was evaluated by using 'sales/labor cost', but productivity failed to be described.

One prime example of this fallacy was illustrated by a business which used the ratio of 'sales/labor hour' as a measurement. Calculations of the ratio, over a period of several years, began at \$5.50 and rose to \$8.00. The group vice-president of the organization stated, "That's only because we've been pushing for productivity, and we have improved it" (Barrett, 1973, p. 83). A necessary price per meal increase alone was the possible cause for this ratio to rise over a "number of years"; therefore, that ratio did not necessarily evaluate a change in productivity (Freshwater & Bragg, 1975).

A correct productivity measurement was used in several cases when the ratio was 'meals/labor hour' (Brown, 1972; Maclean, 1975; Ruf & David, 1975; Wells, 1972) or 'meals/full-time equivalent worker' (Borzenik, 1973). People could compare like ratios at various times within an organization or for organizations of like characteristics, although that was not a part of those studies. Those measurements would be effective management tools by generating new knowledge and providing information to improve operations or design better systems.

Sky Chefs monitored the performance of labor by recording meals/Equivalent employee (EE) (Productivity Measurement Still a Cottage Industry, 1981). Since they provided a variety of meals, they made adjustments. For example, a first-class meal required more labor than a coach meal. Therefore, they devised a system in which they assigned a value of "1" to the labor required for a domestic coach meal. They then measured other meals against that. If a sandwich snack took 0.4 as much time as a coach meal, it assumed a weight of 0.4, etc. They multiplied the total number of each type of meal by its "weight", added the products, and divided by the number of EE's.

Kaud (1980) conducted a study in 10 hospitals partly to see if the type of foodservice system affected performance productivity. One of the ratios he used to determine productivity was 'meals/paid hour'. Kaud concluded that the highest productivity was in a hospital with centralized production, cook-chill assembly and microwave ovens. He also concluded that while the proper type of system is helpful to some degree, the major impact on productivity arises from good management practices.

Weisman (1980) also did some detailed analyses of cost and performance productivity in health care foodservice systems. The following are a few of the measures he utilized to track the "Dietary Employee Proficiency" of nine hospitals over a 12 month period.

$$\frac{\text{Patient meals}}{\text{Productive labor hour}^1}$$

$$\frac{\text{Transactions}^4}{\text{Paid Labor hour}}$$

$$\frac{\text{Patient meals}}{\text{Paid labor hour}^2}$$

$$\frac{\text{Transactions}}{\text{Prod. F.T.E./month}^5}$$

$$\frac{\text{M.E.}^3}{\text{Productive labor hour}}$$

$$\frac{\text{Productive work hours}}{\text{Patient day}}$$

$$\frac{\text{M.E.}}{\text{Paid labor hour}}$$

$$\frac{\text{Total units of service}^6}{\text{Productive labor hour}}$$

¹Productive labor hour--identified the labor investment made for those employees on the job.

²Paid labor--total of all incurred labor costs.

³M.E.--meal equivalent value or meal equivalent sales (for non-patient cafeteria).

⁴Transactions--count recorded on cash register with the entry of the sale.

⁵F.T.E.--Full-time equivalent employees working a defined number of hours per month.

⁶Unit of service--M.E.'s and patient trays.

Productivity Improvements in Foodservice

In the past, researchers scrutinized physical facilities and layout, types of food used, and technical operational procedures (Donaldson, 1967a). Productivity, however, is mainly a function of "the method of scheduling personnel, system of materials handling, work methods and standards of production and service, degree of training of personnel, and general management procedures" (Donaldson, 1967a, p. 20).

Maclean (1975) found that productivity improvements result only with the effective use of management tools such as sound personnel policies, job training, job analysis, realistic time scheduling, work improvement techniques, and production standards. The opportunities open to the foodservice industry for productivity improvement are enormous. The industry needs to understand and be aware of the concepts of productivity and productivity management, then it needs a method "by which groups can create productivity management systems suited to their own inevitably special circumstances" (Sink, 1980a, p. 4).

The literature was full of cases where productivity was improved in industrial settings by use of quality circles and other participative management programs. Sky Chefs' President James O'Neill followed this philosophy when he stated "The guy who runs the dish machine knows his job better than his manager knows it, and certainly better than I. Ask him what would make his job easier or faster. He'll know." (Productivity measurement still a cottage industry, 1981, p. 12).

CHAPTER III

RESEARCH PROCEDURES

The literature indicated a need for research in productivity measurement in the foodservice industry. This study was to identify partial factor productivity measures in health care delivery systems. The type of research design, population and sample description, data collection (which includes planning and development, instrumentation, and procedures), and data analyses were included in this chapter.

Type of Research Design

The preliminary studies utilized action research while the actual study used status survey research design. "The dynamic nature of real organizations creates a need for practical process oriented research" (Sink, 1978, p. 108). In action research the planned change was "directed toward developing new skills or new approaches and solving problems by means of actual involvement and direct application" (Joseph & Joseph, 1979, p. 18). Research data was systematically collected in on-going systems (French & Bell, 1978) relative to productivity measurement, and action was taken to identify partial factor productivity measures with possible usefulness in those organizations.

Action research worked well in implementing new procedures to improve productivity in a hotel foodservice (Whyte & Hamilton, 1964), educational settings (Corey, 1953), and the public sector (Brimeyer &

Sink, 1979). Isaac and Michael (1971, p. 17) described this type of research as being

. . . practical and directly relevant to an actual situation in the working world . . . It also relies on actual observations and behavioral data, and does not fall back on subjective committee 'studies' or opinions of people based on their past experience.

Bennis, Benne, Chin, and Corey (1976) identified action research as a plan to improve the problem-solving capacity of an organization. This design allowed an organization to help develop its own changes, thus encouraging implementation. The change strategies used in the preliminary studies were designed to help the organization plan productivity measurement and improvement programs which would help "detect problems or problem areas for improvement", assist in diagnosis of the problems, and help "facilitate action which may be taken to enhance productivity" (Sink, 1978, p. 183).

In several ways, the preliminary studies were also exploratory field studies. They sought what was rather than predicted relations. According to Kerlinger (1978, p. 40) the purposes of exploratory field study were to "discover significant variables" and their relationships in the field situation and to "lay groundwork for later, more systematic and rigorous testing of hypotheses."

The actual study utilized a status survey research design. Current practices and beliefs gathered in the preliminary study were used in the survey. The model (Figure 3) illustrates the research design. The sample, which the moderating variables represent, was chosen at random. The transformation process variable involved field research. A set of partial factor productivity measures immediately resulted from the action research. Productivity improvement in hospital dietary departments will

Moderating Variables

Independent Variables

Dependent Variables

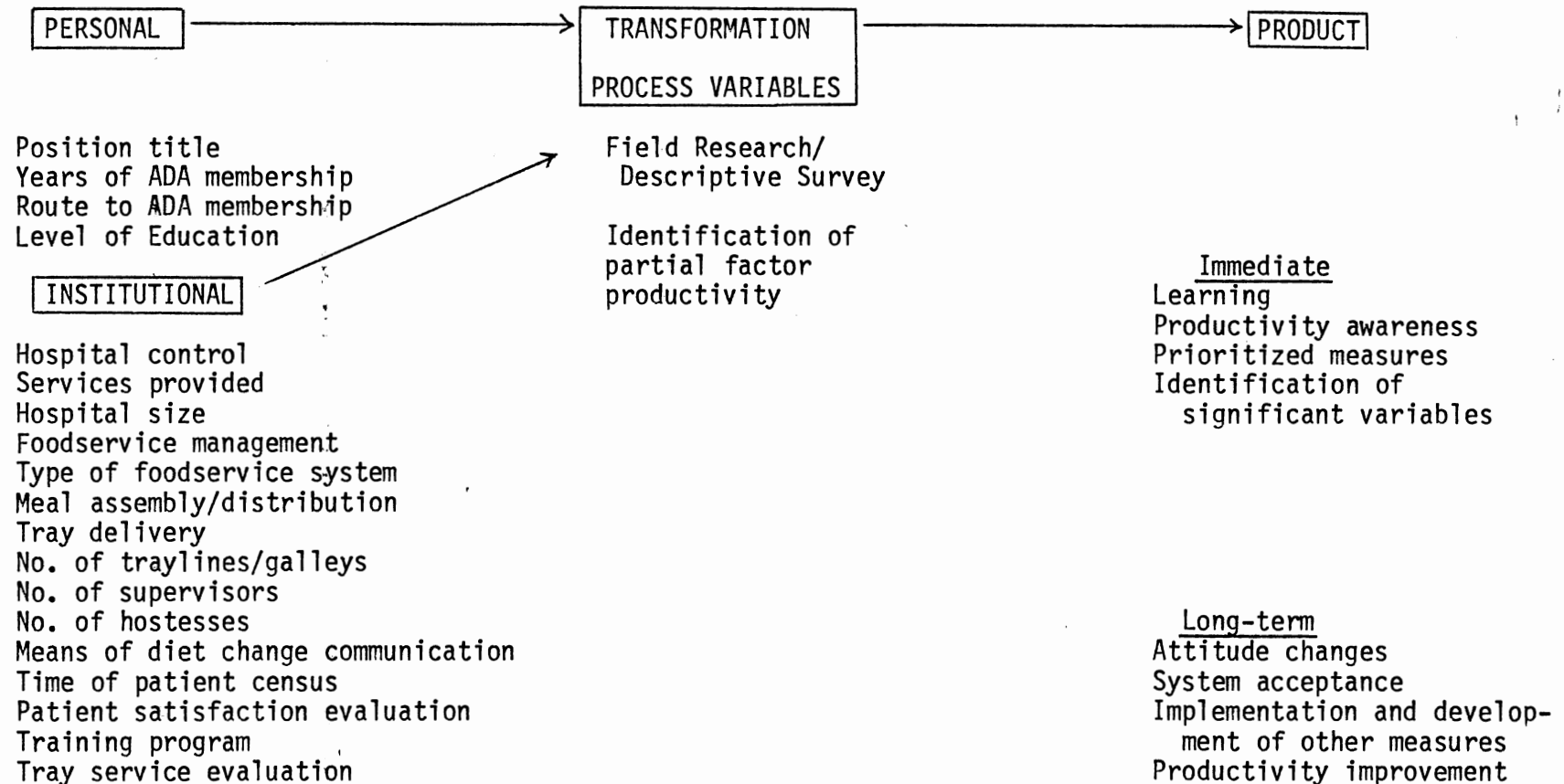


Figure 3. Research Design Model

hopefully be the major long-term goal. Exploratory as well as confirmatory analysis was performed.

Population and Sample

The identified samples in the action research portion of this study included the foodservice manager and catering supervisor of an Oklahoma State University foodservice and a dietitian and four trayline supervisors in a dietary department of a 723-bed hospital in Tulsa, Oklahoma. The university foodservice catered luncheon buffets, banquets, and receptions. The services and programs of the medical facility included the following: medical/surgical care, intensive care, cardiac center, arthritis center, regional maternal-fetal center, family-centered maternity care program, pediatrics, skilled nursing unit, orth/neuro, emergency services, psychiatry, cancer center, alcoholism treatment center, and other ancillary services.

For the actual study, the sample came from a population including ADA members belonging to the management division's practice group called "Dietitians with Management Responsibilities in Health Care Delivery Systems" (See Appendix B). ADA provided a mailing list of those individuals.

A total sample of 1811 names and addresses of the defined population came from the ADA membership data base. From that list, a total sample of 906 names was randomly selected for distribution of the research instrument.

Data Collection

Planning

The initial plan for this study was to explore the feasibility of

performing action research in foodservice systems. The purpose was to identify and implement the use of partial factor productivity measures to track and eventually improve productivity in foodservice systems. Whyte and Hamilton (1964) were successful in performing action research in a hotel foodservice in the 1940's. The conditions and techniques used, however, were different from those planned for the present study.

The Nominal Group Technique (NGT) (Delbecq, Van de Ven & Gustafson, 1975) was the involvement strategy utilized by the researcher in the action research. (Appendix C contains a brief description and instructions). Action research required the following criteria for optimum effectiveness: a) top management commitment, b) a participative decision strategy, c) group ability to learn, and d) individual acceptance.

The most important criteria was top management commitment.

If top management does not show support and commitment, there is a tendency for others in the organization to essentially 'go through the motions', but if top management is supporting a program and participating in it, then there seems to be more enthusiasm and interest among subordinates to follow their example" (Szilagyi, 1981, p. 686).

The basic philosophy of NGT was that those who would be affected by the change must participate in the planning (Morris, 1979). Therefore, a participative decision strategy was also essential in this study. Advantages of participation include the high probability of acceptance and the tapping of all the available knowledge (Morris, 1979). Without good and representative information the project would have been useless --it would have been blindly based (Szilagyi, 1981). Factors considered critical by a foodservice/healthcare organization were important and required definition by participants in the organization.

People have criticized participative decision strategies in the past because of organizational difficulties, high costs, and occasional

lack of useful results. The Nominal Group Technique, however, was structured and has proven effective and efficient in time utilization to provide a reasonable benefit/burden (Sink, 1978).

The ability of individuals to measure and improve productivity in their area was another important factor. The capability and responsibility of the group to measure, look at results, and try to improve ratios, could significantly affect their motivation to improve productivity. This in turn could benefit the entire dietary department in general.

Finally, the individuals involved had to accept the need for the program. Their commitment was necessary for performance of the type of activities necessary in order to reach the goals.

Development/Preliminary Studies

Research activities began in Spring, 1981, in a university foodservice system to study catering. Commitment from the foodservice manager and catering manager for a participative strategy did not exist, hence the NGT could not be utilized. The foodservice personnel involved in the catering function did not have an opportunity for involvement in the proposed research activities. The researcher was, however, allowed to identify partial factor productivity ratios. These were shared with the foodservice manager who agreed that the ratios would be helpful in tracking productivity. Although the foodservice manager had become aware of productivity measurement, a willingness to change the system was lacking. Therefore, the ratios were not implemented in that foodservice system.

In September, 1981, research activities began in a medical center foodservice system. A meeting was held with the director of the dietary department to discuss productivity and to find out the status of productivity understanding and measurement in the organization. Possible outcomes of the program for the researcher and for the operation were discussed. A training session and NGT was scheduled.

In this situation sufficient top management commitment existed to allow the participative group strategy. Two weeks later, a group meeting was held with the administrative dietitian and the four trayline supervisors. During the first half hour of the meeting, training on basic productivity concepts occurred. It was hoped that the training would increase the knowledge and awareness of the group to enable them to generate partial factor productivity measures which they felt could be useful to measure productivity in their health care delivery system.

The remaining one and one-half hours of that meeting were spent performing a NGT. The purpose was stated, the steps of the NGT were explained, and the group was told how the results of the NGT would be used (Morris, 1979).

The group then began the process by silent generation, round-robin listing, and clarification of outputs of their department. They then repeated with the inputs. The participants then viewed the total list of outputs and inputs and spent time silent generating O/I ratios possibly useful for measuring productivity.

The individuals in the group were capable of learning to measure the productivity of their trayline. The outcome of the NGT was a list of outputs and inputs which lent themselves to developing ratios to measure productivity (ratios may be seen in Figure 4). A ranking of the five most important ratios (Table I) was also obtained from the NGT.

$$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$$

$$\frac{\text{correct trays served}}{\text{labor hours}}$$

$$\frac{\text{meals delivered}}{\text{hostess labor hours}}$$

$$\frac{\text{patients served}}{\text{trays prepared}}$$

$$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$$

$$\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$$

$$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$$

$$\frac{\text{menu modifications}}{\text{\# items in menu selection}}$$

$$\frac{\text{\# of employee complaints}}{\text{type of communication}}$$

$$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$$

$$\frac{\text{employee longevity}}{\text{intensity of training}}$$

Figure 4. Measurement Ratios

TABLE I
RANKING OF RATIOS IN PRELIMINARY STUDY

Ratio	Times Ranked	Total Ranking Points
<u>patient satisfaction (food temp)</u> delivery time	5	18
<u>correct trays served</u> labor hours	4	14
<u>labor hours expended</u> labor hours scheduled	3	8
<u>employee longevity</u> intensity of training	3	7
<u>overall patient satisfaction</u> # items in menu selection	3	7

The ratios developed were a mixture of standard output/input productivity measures ('patients fed (midnight census)/labor hour', 'correct trays served/labor hour', and 'meals served/hostess labor hour') and other non-standard productivity measures which the group stated could also benefit their dietary/nutrition department. The productivity ratios identified resembled other productivity ratios used by Brown (1972), Maclean (1975), Ruf and David (1975), Wells (1972), Kaud (1980), and Weisman (1980). The non-standard ratios included indexes, outcome measures (such as patient satisfaction), and measures of the transformation process (such as type of communication and menu variety). The questionnaire, however, included all ratios the group identified to see which types of ratios the sample valued most.

The next phase of the program was operationalization of one or more of the identified ratios. This would lead to productivity tracking and eventual improvement. The decision of whether or not to continue the program was delegated to the group itself with no leadership from management. The administrative dietitian and supervisors were unwilling to provide the time and commitment necessary to complete the productivity measurement and improvement program.

Based on these two preliminary studies, it was deemed unfeasible to perform action research unless management truly realized the potential benefits of tracking productivity and were willing to commit their time and effort to operationalize a program. Since partial factor productivity ratios from the hospital foodservice tray system had been generated, the researcher decided that perhaps dietitians with management responsibilities in health care delivery systems needed to be surveyed to discover if they would identify the same ratios, if they were using similar ratios, or if they would derive other ratios. The gathering of that information was accomplished through the use of a questionnaire sent to the sample described. Figure 5 shows a brief overview of the planning and development of the actual research.

Instrumentation and Procedures

A questionnaire was designed to include a section on general demographic variables and performance evaluation measures, and a section involving productivity and other ratios (Appendix D). Personal variables included the participants' position title, level of education, years of ADA membership, and route to ADA membership. General institution variables included the type of hospital and foodservice control,

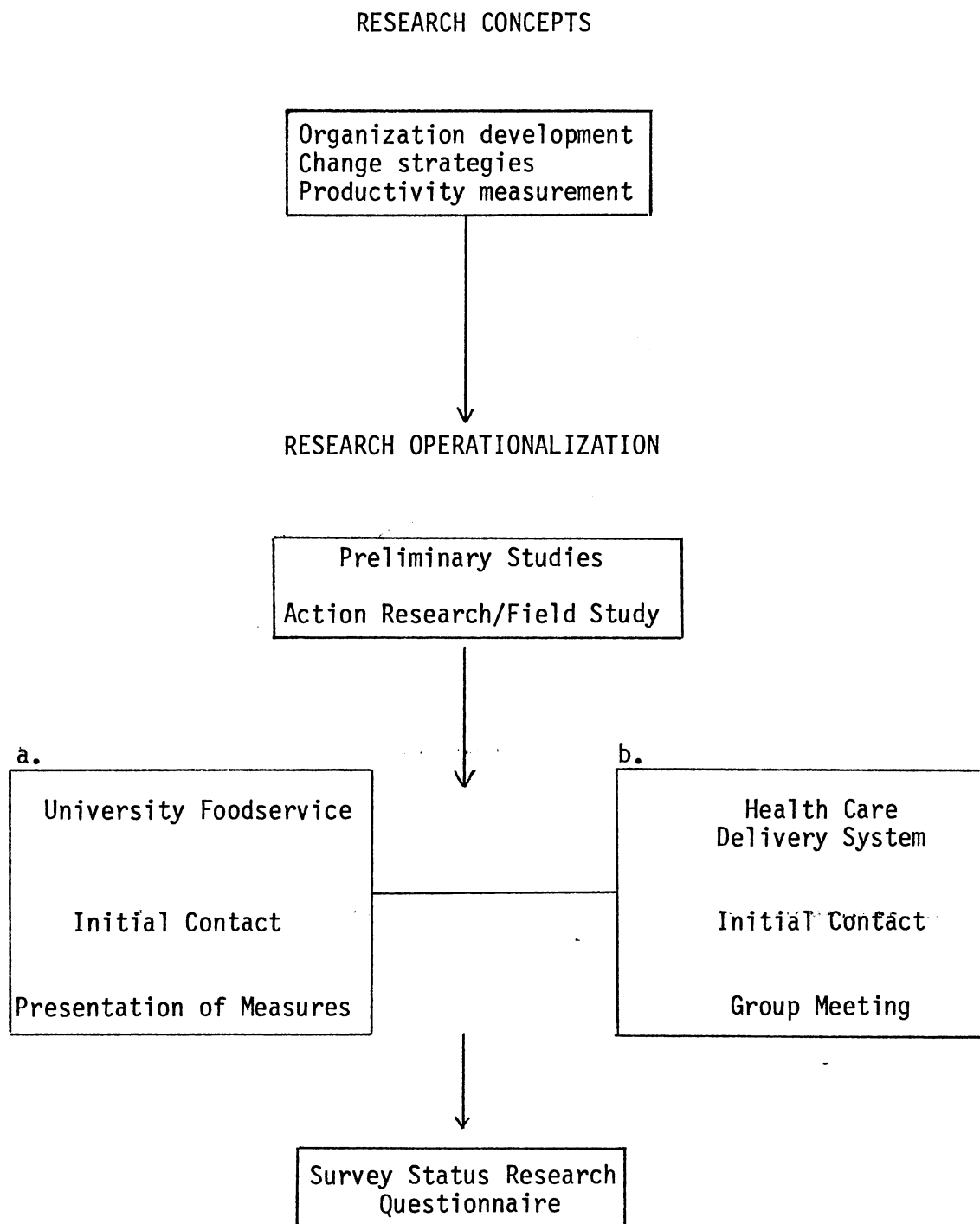


Figure 5. Research Development

type of medical service provided, hospital size, and type of foodservice system. Trayline institutional variables encompassed the type of assembly and distribution and the person responsible for the delivery of trays to patients, number of traylines/galleys, supervisors and hostesses, means of diet change communication, time of patient census, method and frequency of patient satisfaction measurement, and the intensity of the training program.

The participants were also asked how they evaluated their tray service. The list of methods from which they could choose included cost trends, cost/revenue ratios, indicators, indexes, productivity ratios, and others. Beside each method used, they were requested to list the specific measures which they actually monitored.

The section which involved the productivity ratios required that the participant which received the questionnaire join with the trayline supervisors to come to a group consensus. The eleven ratios which resulted from the NGT in the preliminary study were listed. The group decided which of those ratios could be useful in measuring the productivity of their trayline/galley and which ones were already in use for that purpose. They then chose the five most important ratios, and ranked them one to five, with five being the most important.

The final section of the survey gave the participants a chance to list any measures not already identified which would be useful in their trayline service to measure productivity. A space for additional comments was also provided.

The questionnaire, sent November 20, 1981, was accompanied by a cover letter (Appendix E) which explained the purpose of the study. Also included was a postage paid business reply envelope to facilitate

return of the instrument. Each questionnaire was coded for research use only. On December 15, 1981, reminder postcards were sent to the individuals in the sample who had not yet returned the questionnaire (Appendix E).

Data Analysis

Data concerning demographic variables were transcribed and processed onto one computer card per respondent for standard statistical analysis using the Statistical Analysis System (SAS) (Barr & Goodnight, 1972). Productivity ratio data were recorded on an additional card per respondent. The productivity ratio data included three variables for each of the 11 ratios. Those variables were: a) whether the ratio could be useful; b) whether the ratio was presently used; and c) the rank, or importance of that ratio in the respondent's specific trayline service.

Frequency distributions were compiled for all items on the research instrument. A description of the ratios which were ranked was accomplished by the assignment of points to the rankings. For example, a ratio ranking five received five points, a ratio ranking four received four points, etc.

Chi square was used to study the relationship between each of the nineteen demographic variables and each of the thirty-three productivity ratio variables and to answer the question of whether differences could have occurred by chance alone. The chi square tables in the following section include X^2 , Df and prob. The formula for the X^2 test is the following:

$$X^2 = E \frac{(f_o - f_e)^2}{f_e}$$

The formula means "Subtract each expected frequency, f_e , from the comparable obtained frequency, f_o , square the difference, divide the difference squared by the expected frequency, f_e , and then add up these quotients" (Kerlinger, 1973, p. 168). X^2 depends upon the difference between the actual observed values and those expected if the hypothesis were true. The larger the difference the higher the X^2 value. Therefore, a high X^2 value implies that the hypothesis is probably incorrect and that researchers have a better chance of being right if they fail to accept the hypothesis than if they accept it.

The degrees of freedom, df , is dependent upon the possible number of responses to a question. The greater the variety of responses the greater the df . Prob. is the probability of X^2 value equal to or greater than that obtained in the experiment if the hypothesis is incorrect. Therefore, a small prob. value indicates that the hypothesis has little chance of being correct. By convention, when the prob. value is less than 0.10 researchers fail to accept their hypothesis.

In the example provided, since X^2 is large (14.256) and prob. is very small (0.0008) researchers can say that the hypothesis has less than a one in ten chance (a 0.10 chance) of being correct. Therefore, the researchers can be more than 90 percent confident that the differences in responses by those three groups were not due to chance alone and that there really is a significant difference.

Number of Hostesses	Ratio 3 ^a
0	1/2.17 ^b
1-9	9/9.00
> 9	5/35.71
X^2	14.256
Df	2
Prob	0.0008

^a Frequency/Percent

^b Ratios are enumerated on p. 123

CHAPTER IV

RESULTS AND DISCUSSION

This chapter describes the personal characteristics of respondents, characteristics of the institutions, and traylines a description of which ratios respondents and their supervisors perceived as useful, a description of ratios which are being used currently in the traylines, and ranking of those ratios which the respondents distinguished as most important in their delivery systems. Data analyses which evaluate the hypotheses are also included in this chapter.

Data to answer the research question were obtained from utilization of a questionnaire. The response rate of the identified sample was 22 percent (N=199) of which 17.7 percent (N=160) were usable. Perhaps the low response rate was due to the fact that the accomplishment of a group consensus was a time consuming process. Many dietitians may have seen unable to perform a group strategy, and thus, did not complete the questionnaire.

Characteristics of Respondents

Position Title and Education

Over one-half of the respondents that participated in the study had the position title of director. One-fifth were assistant directors, and one-fifth were administrative dietitians (Table II).

TABLE II
 FREQUENCY DISTRIBUTION OF RESPONDENTS' POSITION TITLES

Position Title	Number (Percent)
Director	83 (52)
Assistant Director	31 (19)
Administrative Dietitian	27 (17)
Generalist Dietitian	6 (4)
Health Care Facility Consultant	1 (1)
Clinical Staff Dietitian	1 (1)
Other	11 (6)

Approximately two-thirds of the respondents had completed a Master's degree. More detail on educational level is shown in Table III.

TABLE III
 FREQUENCY DISTRIBUTION OF RESPONDENTS' EDUCATIONAL LEVELS

Educational Level	Number (Percent)
Bachelor's Degree	66 (41)
Graduate work, degree not completed	37 (23)
Master's Degree	51 (32)
Doctoral work, degree not completed	1 (1)
Doctoral Degree	2 (1)

ADA Membership

Three-fifths (61 percent, N=97) of the respondents became qualified for ADA membership through completion of internship. The route taken by 16 percent (N=25) was completion of traineeship. Ten percent (N=16) completed a Master's degree plus six months work experience and seven percent (N=11) completed a coordinated under graduate program. Other responses were given by seven percent (N=11) of the individuals. One-half (51 percent, N=82) of the dietitians had been members of ADA for 10 or less years while the others had been members for 11 to more than 30 years.

Characteristics of the Institutions

Hospital Control, Services, and Size

One-half (49 percent, N=80) of the institutions were nongovernment, not-for-profit hospitals, such as church hospitals. Nonfederal government, such as state, county, or city, controlled 26 percent (N=42) of the hospitals and 14 percent (N=23) were owned for profit by investors. The federal government was in control of 8 percent (N=12). Two other institutions (1 percent) were osteopathic hospitals.

Seventy-nine percent (N=126) of the hospitals provided general medical services. Various other special services were provided by the remaining 21 percent (N=34). Of the 160 hospitals represented, almost one-half had from 300-999 beds. A further breakdown in size is illustrated in Table IV.

Type of Foodservice System

Eighty-seven percent (N=139) of the foodservices were managed by the

hospital while 13 percent (N=20) of them were contracted to a food or management company. A conventional foodservice system (production and service of quality food within one foodservice operation while effectively utilizing all renewable resources) best described 89 percent (N=142) of the foodservice systems. Five percent (N=8) were assembly-serve foodservice systems and 6 percent (N=9) were of some other type.

TABLE IV
FREQUENCY DISTRIBUTION OF HOSPITAL SIZE

Hospital Size	Number (Percent)
<100	25 (16)
100-299	55 (35)
300-999	72 (45)
≥ 1000	7 (5)

Patient Census and Patient Satisfaction

Over half (55 percent, N=88) of the foodservices obtained a patient census once per day, usually at midnight. Twelve percent (N=19) collected that data twice per day, at midnight and before lunch, and 15 percent (N=24) obtained it before or after each meal. Nineteen percent (N=29) recorded it at some other time(s) in the day.

Patient satisfaction regarding quality of meals served was determined by survey in 51 percent (N=81) of the foodservices and verbally by

44 percent (N=71) of the foodservices. Five percent (N=8) of the respondents did not provide this information. In one-third (31 percent, N=49) of the foodservices patient satisfaction was evaluated daily (most of which were done verbally). Over one-third had evaluations weekly, monthly or quarterly, and 22 percent (N=34) evaluated patient satisfaction at unknown time intervals. One percent (N=1) did not evaluate patient satisfaction.

Characteristics of the Traylines

Three-fourths (73 percent, N=116) of the respondents replied that their assembly and distribution of meals was centralized. Four percent (N=7) stated that their service systems were decentralized. By the other responses given, it could be derived that the question had been misunderstood, therefore statistical analysis of this variable was not performed.

In 57 percent (N=92) of the hospitals, delivering trays to the patients was the responsibility of the nursing department. The foodservice department was responsible for this service in 39 percent (N=62) of the institutions while the responsibility belonged elsewhere in four percent (N=7) of the institutions.

Number of Traylines, Supervisors, and Hostesses

Eighty-two percent (N=131) of the foodservice systems reported having only one trayline. Twelve percent (N=19) had more than one while six percent (N=9) did not have traylines. While 88 percent (N=141) of the respondents reported having no galleys, 12 percent (N=19) reported having one galley or more in their delivery system.

Forty percent (N=64) of the respondents reported that they had one trayline or galley supervisor. Forty percent (N=64) had from two to four supervisors. Ten percent (N=15) employed five or more supervisors while 10 percent (N=15) reported having no supervisors in charge of the traylines or galleys. Several respondents commented that their supervisors had other supervisory responsibilities in addition to the traylines or galleys.

Sixty-nine percent (N=114) of the participating foodservices employed one or more hostesses (persons who carry the menus or visit the patients other than the dietitians). Of those 114 participants, 22 had one hostess, 29 had two hostesses, and 63 had three or more hostesses. Twenty-nine percent (N=46) reported that there are no hostesses employed for this function and two percent (N=3) stated that a person other than a hostess or dietitian fulfilled those duties.

Means of Diet Change Communication

On the question of how diet changes were communicated to the dietary/nutrition department, respondents were permitted to designate all descriptions that were applicable to their institution. The telephone was used most frequently with one-half of the respondents reporting its use. The memo was also used frequently. Other responses are reported in Table V.

Training Program Intensity

Forty-three percent (N=68) of the respondents reported having training programs of one to three days for new trayline personnel. Thirty-five percent (N=55) of the programs were one to two weeks in

TABLE V
FREQUENCY DISTRIBUTION FOR MEANS OF
DIET CHANGE COMMUNICATION

Means of Communication	Number (Percent)
Telephone	82 (51)
Memo	64 (40.5)
Diet Change Sheets	28 (17.0)
Pneumatic Tube	26 (16.5)
Computer	14 (8.9)
Nurse	13 (8.2)
Chart	12 (7.5)
Infolink	9 (6.3)
Cathode Ray Tube	8 (5)
Intercom	6 (4)
Hostess	3 (1.9)
Other	4 (2.5)

length while 21 percent (N=33) were two or more weeks. The reader is reminded that many of the trainees had supervisory responsibilities of other functions in addition to supervision of trayline service or galleys. Two respondents (1 percent) reported no training program and three respondents (2 percent) did not provide the information.

Tray Service Evaluation

In addition to determining the nature, extent and scope of tray service evaluation in hospitals, productivity knowledge of dietitians with management responsibilities in health care institutions was gleaned through this part of the study. Participants were asked to designate which of the methods provided described the data that they were currently collecting. Beside each method they selected, they were asked to list specific measures in each category which they were using.

Although 44 percent of the participants checked that they used productivity ratios, relatively few wrote down a true productivity ratio which they were using. Also, many of those who listed output/input measures placed them in categories other than productivity ratios. It could be seen, therefore, that the participants' understanding of the term was not clear. Several participants commented that the productivity ratios needed more explanation, that the ratios were confusing, and that they were not familiar with productivity ratios. Since some of the measures reported were inappropriately classified, the researcher transcribed the responses into the suitable categories for the purpose of analysis.

Of the 160 respondents, 80 percent (N=128) reported using cost trends, 67.5 percent (N=108) used indicators such as absenteeism, etc.,

42 percent (N=67) used indexes, 29 percent (N=63) used productivity ratios, and 27 percent (N=43) used cost/revenue ratios. A list of the methods of tray service evaluation which are currently being used in the hospitals surveyed can be seen in Table VI.

The three most frequently used cost trend measures were raw food, labor, and supply costs. For cost/revenue, cafeteria income and 'food cost/revenue' were the two most used measures. Patient satisfaction, absenteeism, and turnover were indicators which were used most often. Indexes generally used were comparisons over time of labor and raw food costs. The most frequently reported productivity ratio was 'meals/manhour' and 'trays/minute'. Measures reported in this study were in agreement with Sumanth's (1981, p. 71) findings where he stated that "although companies seem to think that they have 'productivity' measures, what they mean by 'productivity' seems to be quite different from the formal meaning of productivity defined previously".

Out of a total of 740 responses, 72 (9.7 percent) were standard partial factor productivity measures. In contrast, the productivity indicators used by major U.S. manufacturing companies included 19.3 percent factor productivity indicators (Sumanth, 1981, p. 70).

Profile of Productivity Ratios Selected by Respondents

In the final sections of the questionnaire, respondents designated which ratios they perceived as useful, which they were currently using and which were most important to measure productivity of their trayline. Table VII is a list of the ratios included in the questionnaire and the results. The ratios are listed in order by the total number of points

TABLE VI

METHODS OF PERFORMANCE EVALUATION IN
HEALTH CARE DELIVERY SYSTEMS

Performance Measures	Number of times Mentioned	% of Total Responses
1. <u>Cost Trends</u>		
Raw food cost	85	
Labor cost	83	
Supply cost	25	
Cost/meal	17	
Budget costs	14	
Maintenance cost	12	
Food cost/meal	11	
Labor cost/meal	7	
Total cost	7	
Cost/patient day	4	
Overhead		
Prepared food cost		
Cost comparisons of various products		
Supplemental nourishment cost		
ASHFSA		
TOTAL		38%
2. <u>Cost/Revenue</u>		
Cafeteria income	14	
Food cost/revenue	6	
Labor cost/revenue	3	
General		
Cafeteria cost/profit/manhours		
Patient cost/profit/manhour		
Catering cost/profit/manhour		
Cost and revenue/meal		
Monitrend		
TOTAL		5%
3. <u>Indicators</u>		
Patient Satisfaction	69	
Absenteeism	28	
Turnover	24	
Temperature logs	14	
Test tray evaluation--accuracy & quality	20	
Labor hours	10	
Patient census	9	
Overtime	7	

TABLE VI (Continued)

Performance Measures	Number of times Mentioned	% of Total Responses
(3. Indicators, continued)		
Plate waste	6	
Meals served	7	
Delivery time	5	
Late trays	4	
Exit interviews		
Quality of training		
Disciplinary reports		
Employee and customer satisfaction		
Rounds reports		
Production sheets		
Percent employee leave used		
Budget estimates		
Patient meals/patient days		
Trays/month		
Cafeteria and catering meals		
Number of special diets ordered		
Check average/cafeteria meal		
Monthly & annual charges		
Inventory control		
Menu variety		
Accidents/manhour		
Sanitation/safety rounds		
Labor utilization		
Diet technician hours/patient satisfaction		
# food items missed or incorrect/total time length of that specific meals' trayline service		
Amount of time trayline stops/# employees on trayline		
Trays picked up after each meal/trays actually served.		
TOTAL		33%
4. <u>Indexes</u>		
Monthly and/or yearly comparisons of:		
Labor hours	34	
Raw food cost	29	
Cumulative costs	2	
Expenses		
Income		
Supply costs		
Meals/hour		
Meal cost/patient day		
Census		
Average meals/day		
Labor hours/week		
Maintenance		
TOTAL		12%

TABLE VI (Continued)

Performance Measures	Number of times Mentioned	% of Total Responses
<u>5. Productivity Ratios</u>		
Meals or trays/standard time worked		
Meals or trays/standard time paid	67	
Trays delivered/delivery time		
Sandwiches/hour		
Donuts/hour		
TOTAL		10%
<u>6. Inverted Productivity Ratios</u>		
Standard time/meals or trays	15	
TOTAL	<u>15</u>	<u>2%</u>
	740	100%

which each ratio received in the ranking. The value of five was given to the ratio considered most important by the respondents. Ratio values were then translated to equal point values. Therefore, the more points a ratio received, the more important it was considered by the sample.

The reader is encouraged to take note that the ratios listed which were indexes and 'outcome variables/transformation variables' are not true productivity measures. For example, 'patients served/trays prepared', an index, would show what percent of trays were actually used. 'Labor hours expended/labor hours scheduled' would result in information on absenteeism and/or overtime. Those figures may indeed be useful, however, they do not compare how effective the product or service was and how efficiently the resources were used.

TABLE VII

FREQUENCY DISTRIBUTION TABLE OF RATIOS PERCEIVED AS USEFUL, USED NOW,
AND CONSIDERED MOST IMPORTANT BY RESPONDENTS

Ratios	Ratio Description	Type of Measure	Use Now	Could Be Useful	Times Ranked/ Total Ranking Points
<u>patient satisfaction (food temp)</u> delivery time	<u>outcome</u> transformation measure	effectiveness	67	84	105/344
<u>patients fed (midnight census)</u> labor hours	<u>output</u> input	productivity	74	79	91/342
<u>labor hours expended</u> labor hours scheduled	<u>actual input</u> expected input	index	65	68	61/186
<u>overall patient satisfaction</u> # items in menu selection	<u>outcome</u> transformation measure	effectiveness	40	73	62/176
<u>correct trays served</u> labor hours	<u>output</u> input	productivity	33	67	57/170
<u>employee longevity</u> intensity of training	<u>outcome</u> transformation measure	effectiveness	22	81	58/166
<u>patients served</u> trays prepared	<u>output</u> output	index	43	64	59/160
<u>overall patient satisfaction</u> type of communication	<u>outcome</u> transformation measures	effectiveness	32	55	42/122
<u>menu modifications</u> # items in menu selection	<u>outcome</u> transformation measures	effectiveness	34	61	43/107
<u># of employee complaints</u> type of communication	<u>outcome</u> transformation measures	effectiveness	24	52	39/108
<u>meals delivered</u> hostess labor hours	<u>output</u> input	productivity	15	34	18/41

It should also be recognized that the 'outcome/transformation variable' ratios show a result of an output and how it was obtained, instead of the outputs themselves (products or services) and resources used. (If terms are confusing see p. 14). Those ratios may be useful in monitoring effectiveness, but efficiency is not measured. "Productivity is a combination of effectiveness and efficiency" or "effectiveness/efficiency" (Mali, 1978, p. 7). As can be seen in Table VII, only three of the ratios listed fall under this category.

Meals and labor were the only outputs and inputs included in the true productivity ratios, probably because foodservice is a very labor-intensive area. There are, however, other inputs and outputs which can be measured in order to implement a total factor productivity program (see Figure 1, p. 14). Since survey participants were asked to add other ratios which were derived from some type of group process and very few were added to the survey forms, it may be postulated that the NGT provided a fairly exhaustive list of ratios important in measuring the productivity and performance of traylines in health care foodservice systems at this time. But as foodservice managers and management dietitians become more familiar with the concept of productivity, more expanded programs may be forthcoming.

Since a service organization was studied, many perceptual measures were identified as measures to indicate effectiveness or efficiency. Those measures, although not productivity ratios, can be compared over time and reflect improvements made, but they may not expose whether or not the improvements are worth the resources used.

When collecting data for the productivity measures it should be ensured that it is providing the information needed. For example, the

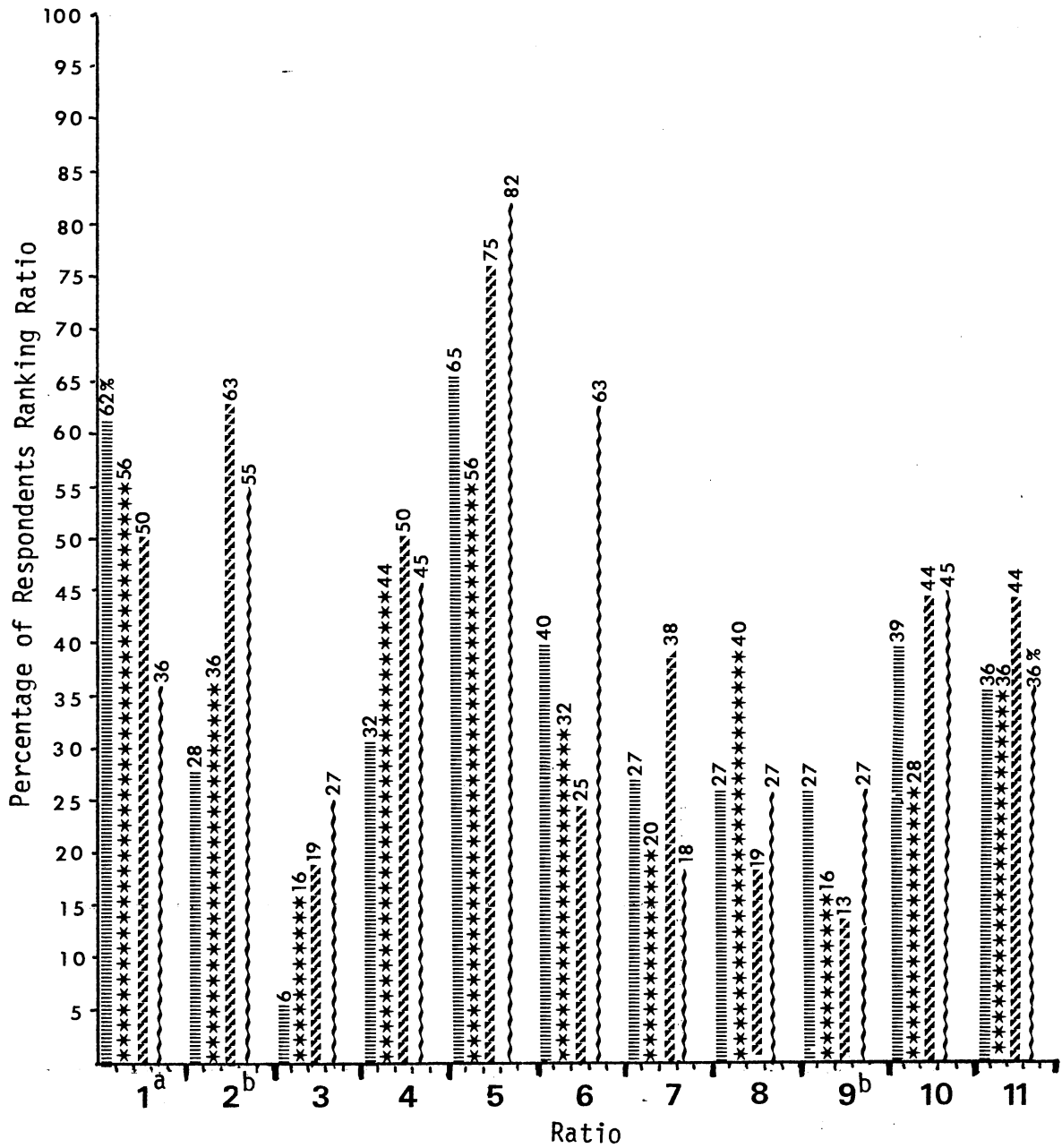
ratio most frequently used by the participants was 'patients fed (midnight census)/labor hour'. This was a true productivity ratio but the validity of the measurement must be questioned. Is the midnight census a true measure of the patients fed? It is realized that the census count is available which would facilitate the use of that figure without the collection of extra data. In particular situations this may be a satisfactory measure, but the reader should be aware of the possible discrepancy between midnight census and patients fed. Also, some ratios identified by the preliminary study may seem unclear or useless for other operations simply because of organizational differences and terminology utilized.

More than one-half the participants of the study perceived 'patient satisfaction (food temperature)/delivery time' and 'employee longevity/intensity of training' to be useful ratios. Neither of those ratios, however, would truly measure a productivity change. They are perceptual measures of outcomes and processes which would show the effectiveness of the trayline and of the training program.

In ranking of the ratios 'patient satisfaction (food temp)/delivery time' was chosen as one of the five most important by each group of respondents except for those using charts as a means of communicating diet changes. 'Patients fed (midnight census)/labor hour' was ranked as one of the five most important ratios by each group except the group of dietitians which become qualified for ADA through a CUP. The CUP graduates chose instead the more accurate productivity ratio 'correct trays served/labor hour'. There is no obvious reason for the uniqueness of these two groups of dietitians.

Although productivity ratios were not perceived as most important to dietitians in the study, certain findings point to some crucial areas which need improvement. The ratios chosen as important included factors such as scheduling, absenteeism, and turnover, which may be areas for research consideration. Miner (1980, p. 32) stated that "when a need moves toward satisfaction it should lose its importance proportionately, and the next higher need . . . should gradually increase in importance." Therefore, since 'patient satisfaction (food temp.)/ delivery time' has been shown to be perceived as most important by a majority of health care delivery systems it may be postulated that there are problems in the area of patient satisfaction with food temperature and delivery time in a majority of institutions studied.

Figures 6 and 7 show detailed descriptive data of how certain groups of respondents ranked the ratios. As can be seen in Figure 6, there was a trend as to which dietitians ranked the true productivity ratios highest. 'Patients fed (midnight census)/labor hours' was most likely to be ranked by dietitians who had completed internships and traineeships. The information for operationalization of this productivity ratio can easily be collected and the ratio may serve as an efficient way of obtaining an estimate of productivity. 'Correct trays served/labor hours' and 'meals delivered/hostess labor hours' are more accurate and detailed measures of productivity which were ranked more often by dietitians who had Master's degrees and who were CUP graduates. Although these ratios would be more effective in terms of accuracy, they also would need to include an evaluation of trays and a monitoring of trays actually delivered.



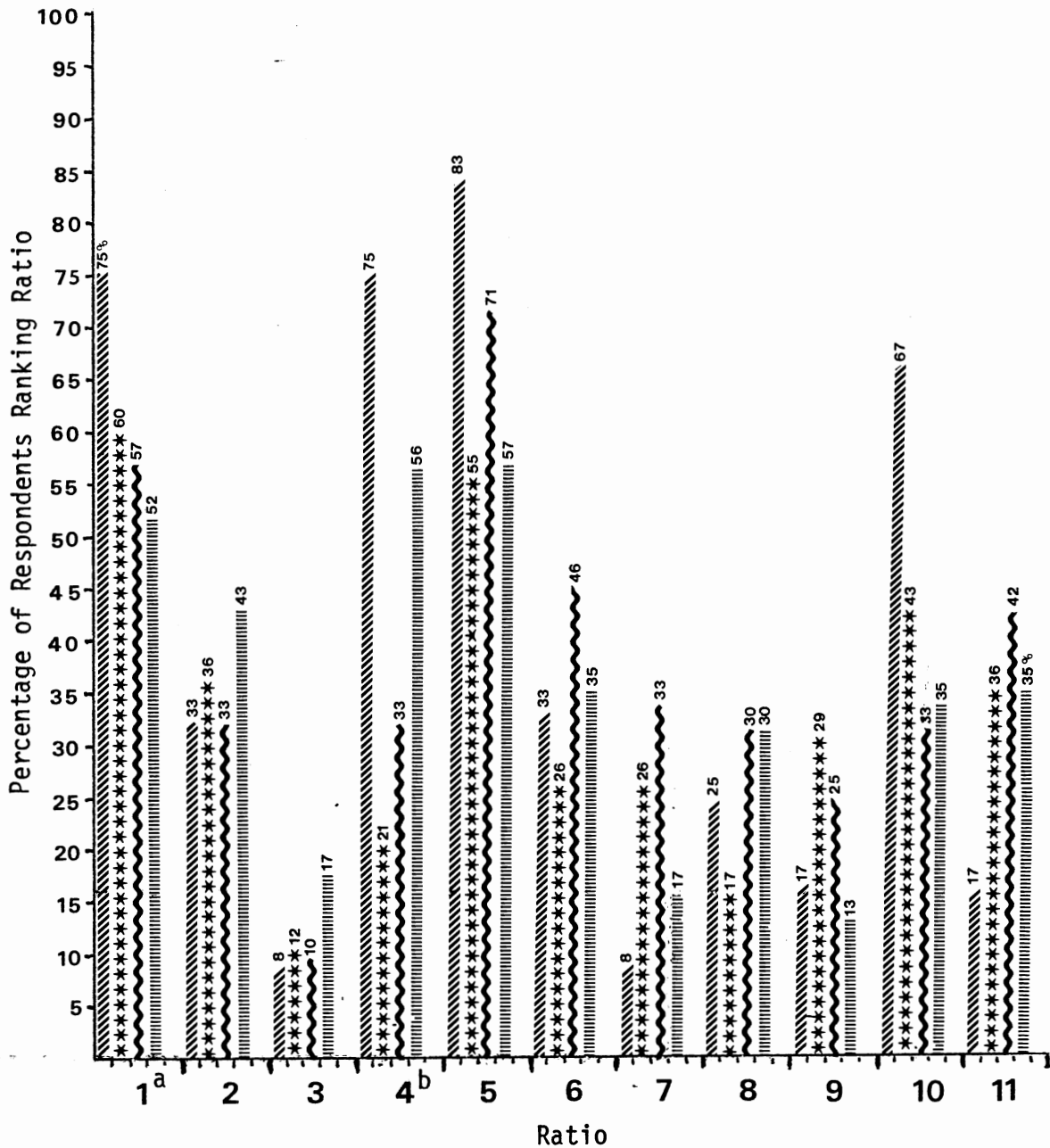
^a Ratio descriptions may be found in Appendix F, page 123.

^b Significant relationships were found between ratios and route to ADA membership.

Route to ADA Membership:

- ▨ Internship (N=97)
- * Traineeship (N=25)
- ▩ Master's degree plus experience (N=26)
- ▧ Coordinated undergraduate program (N=11)

Figure 6. Ratios Ranked as One of the Five Most Important Ratios by Route to ADA Membership



^a Ratio descriptions may be found in Appendix F, page 123.

^b Significant relationships were found between the ratio and type of hospital control.

Type of Hospital Control:

- ▨ Federal government (N=12)
- * Non-federal government (N=42)
- ⌋ Non-government, not-for-profit (N=79)
- ▤ Investor-owned, for profit (N=23)

Figure 7. Ratios Ranked as One of the Five Most Important Ratios by Type of Hospital Control

Dietitians with Master's degrees also showed their preferences for accuracy when they ranked 'patients served/trays prepared' more frequently than did the other dietitians, probably because this data is closely related to correct trays served. Perhaps the difference in the internship's and traineeship's practical experience and the Master's program's research orientation could have resulted in these discrepancies. Internship and CUP graduates were very similar in the way they ranked 'menu modifications/# items in menu selection', '# employee complaints/type of communication' and 'employee longevity/intensity of training', but for no apparent reason.

The importance of accurate productivity ratios to investor-owned, for profit hospitals is shown in Figure 7. This group chose 'correct trays served/labor hour' and 'meals delivered/hostess labor hour' more frequently than did the nonprofit hospitals. Again, this group was likely to rank also 'patients served/trays prepared'.

By observing differences in the ranking of certain ratios by federal government hospitals, one would wonder if those ratios included data required by the federal government. Examples are 'patients fed (midnight census)/labor hours', percent of trays actually served, and 'labor hours expended/labor hours scheduled'. Patient satisfaction may have ranked highest in the group of hospitals owned by the federal government due to the fact that many of the patients in those hospitals are long-term patients.

Evaluation of the Hypotheses

Current Utilization of Ratios

H_1 : There is no significant difference in the partial factor

productivity measures (ratios) utilized by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables seen on pages 3 and 4.

Personal Data Variables

A significant relationship existed between how long a dietitian had belonged to ADA and whether or not several ratios were being used in that delivery system (Table IX, Appendix G). Dietitians who had been members for 11 to 29 years were more likely to be using 'meals delivered/hostess labor hours' than were dietitians belonging to ADA for less than 11 or more than 29 years. Employee moral and communication appeared important to the group of dietitians who had been ADA members from 16 to 29 years. That group was the most likely to use '# employee complaints/type of communication'. It was shown that those who had been members from 6 to 10 years may have valued turnover and training more than other groups. These dietitians used 'employee longevity/intensity of training' more often than other groups did.

Significant associations emerged between route to ADA membership and the utilization of 'meals delivered/hostess labor hours' ($p=0.0863$). The routes available for ADA qualification were completion of an internship, traineeship, Master's degree plus experience, and a coordinated undergraduate program. Those who completed a traineeship were three times as likely to be currently using this ratio as were those who completed an internship. None of the dietitians who became qualified for ADA membership through a coordinated undergraduate program (CUP) or a Master's degree with experience were using it. Possibly the dietitians which completed a traineeship were more aware of the functions of

a dietary hostess than were the other groups, but the relationship was not highly significant.

Institutional Data Variables

A significant relationship existed between hospital size and the utilization of patient satisfaction (food temperature)/delivery time (Table X, Appendix G). Seventy-one percent of the hospitals with over 1000 beds and 60 percent of the hospitals with less than 100 beds currently used this ratio. Only one-third of the hospitals with between 100 and 999 beds used this ratio measuring patient satisfaction and delivery time of food.

There are several factors which could have caused this result. Large hospitals may have had problems sustaining a proper food temperature due to the distance of food transport. Perhaps small hospitals did not have equipment necessary to keep food at the optimum temperature. Insufficient labor to serve the trays quickly may have been another cause. Communication may be another problem that would affect satisfaction with food temperature.

A significant association between type of foodservice system and use of the ratios 'overall patient satisfaction/# items in menu selection' ($p=0.0339$) and 'menu modifications/# items in menu selection' ($p=0.0602$) existed. Hospitals with assembly serve foodservice systems were more likely to use both the ratios than were those with conventional foodservice systems. The number of items in the menu selection was obviously important in assembly serve foodservice. This is, however, reverse of what was expected because the number of items would be a lesser problem in an assembly serve system than in a conventional system.

Whether or not a hospital's foodservice is contracted to a food or management company had a significant effect on the current utilization of 'correct trays served/labor hours' ($p=0.0309$). Hospitals whose foodservices were not contracted to a food or management company were twice as likely to use this ratio as compared to hospitals whose foodservice systems were contracted by a management company.

A significant association emerged between the number of traylines in a delivery system and the use of several ratios (Table XI, Appendix G). Dietitians in hospitals with no traylines used 'menu modifications/# items in menu selection' more often than did those in other hospitals. Menu modifications may be more difficult to perform in galleys than in traylines. When one or more trayline existed, two productivity ratios, 'correct trays served/labor hours' and 'meals delivered/hostess hours' and two effectiveness ratios, '# of employee complaints/type of communication' and 'employee longevity/intensity of training' were utilized more often than when there were no traylines in the foodservice operation. Most likely with more traylines, the importance of measurement of trayline efficiency may increase. Hospitals with galleys instead of traylines were less likely to use 'overall patient satisfaction/type of communication' and '# of employee complaints/type of communication'. Apparently that type of communication may not have been an important issue in hospitals with galleys. With galleys nearby, mistakes may be easily rectified.

The number of trayline supervisors employed made a difference on the utilization of 'menu modifications/# items in menu selection' ($p=0.0934$). Operations with one or more supervisors were more likely to use this ratio than were those without supervisors. Operations without

supervisors did not use the ratio. This association was not, however, highly significant.

A significant association apparently existed between the number of dietary hostesses employed by a hospital and certain ratios (Table XII, Appendix G). Hospitals which have more than nine hostesses were much more likely to use 'meals delivered/hostess labor hours' than were those with less hostesses. Obviously, the more hostesses employed the more important that ratio would become. Those hospitals with more than nine hostesses were also more likely than the other hospitals to be utilizing the effectiveness ratio 'menu modifications/# items in menu selection'. Perhaps hostesses were allowed to make minor (or some) menu modifications; thus, this data could be efficiently collected from one source.

The methods by which diet changes were communicated to the dietary/nutrition department was significantly related to several ratios currently used (Table XIII, Appendix G). A positive relationship appeared between the use of an intercom system and the use of 'correct trays served/labor hours', 'patients served/trays prepared', and 'employee longevity/intensity of training'. Two-thirds of the hospitals which used the intercom system for diet change communication also used 'correct trays served/labor hours', and 81 percent of those who did not use the intercom system did not use the ratio. Two-thirds of the hospitals which used intercom system used 'patients served/trays prepared', and 74 percent of those who did not utilize the system did not use the ratio. It appeared possible that an intercom system may have been a very efficient method of monitoring correct trays and/or patients actually served since the two are often the same and there was a significant association between both ratios and this group of respondents.

A positive association also existed between the use of a nurse for diet change communication and the use of the index 'patients served/trays prepared'. This information would be readily available to the nurses on the floors. 'Meals delivered/hostess hours' and 'employee longevity/intensity of training' were also utilized more often by hospitals who used nurses as a means of communication than by those who did not.

Dietitians who used the telephone as a means of diet change communication were also more likely to use 'labor hours expended/labor hours scheduled' ($p=0.0313$). 'Meals delivered/hostess labor hours' ($p=0.0967$) lent itself less to hospitals using memos for communicating diet changes and found greater utilization by those who used charts. Perhaps charts lend greater utility for this purpose than do memos when hostesses are present.

Significant associations appeared between ratios utilized and time of patient census and patient satisfaction evaluations. When patient census was obtained two or three times per day, dietitians were more likely to use 'menu modifications/# items in menu selection'. The census was possibly obtained simultaneously with menu modifications.

'Labor hours expended/labor hours scheduled' ($p=0.0898$) lended itself to 71 percent of the hospitals which evaluated patient satisfaction only two times per year. Those performing evaluations more frequently than twice per year did not utilize the ratio as often.

Significant associations emerged between the method of present tray service evaluation and the types of productivity ratios utilized (Table XIV, Appendix G). A positive association existed between hospitals that used cost trend analysis and 'patients fed (midnight census)/labor

hours' and 'labor hours expended/labor hours scheduled'. Since labor cost was one of the most utilized cost trends it is reasonable that data concerning labor hours would already have been collected and the information could simply be transferred to the above productivity ratio and index. Significant associations between cost trend analysis and other ratios seen in the table were also positive.

Hospitals were more likely to use 'meals delivered/hostess labor hours' if they used cost/revenue ratios. Hospitals which assessed tray evaluation indicators were more likely to use 'patients fed (midnight census)/labor hours', 'meals delivered/hostess labor hours', 'patient satisfaction (food temp)/delivery time', 'overall patient satisfaction/# items in menu selection', 'menu modifications/# items in menu selection', '# employee complaints/type of communication', and 'labor hours expended/labor hours scheduled' than were those which did not use indicators. All but the first two of those ratios consisted entirely of indicators. Thus the positive association was reasonable.

Evidence also exists for a significant association between the use of indexes in evaluating tray service and the use of various ratios. When indexes were utilized, the use of 'meals delivered/hostess labor hours' and 'overall patient satisfaction/# items in menu selection' increased.

The use of productivity ratios to evaluate tray service was significantly related to the use of several ratios. Those who used productivity ratios were more likely to also use 'patients fed (midnight census)/labor hours'. This association was logical since this truly was a productivity ratio. 'Patients served/trays prepared' was least likely to lend itself to those who utilized productivity ratios.

Ratios currently used were significantly associated with the selected personal and institutional attributes. Therefore the researcher failed to accept H_1 . The variables were tested at 0.10 level of significance.

Ratios Perceived as Useful

H_2 : There is no significant difference in the partial factor productivity measures (ratios) perceived as useful by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables seen on pages 3 and 4.

Personal Data Variables

Position title of the participants significantly affected the perceived usefulness of several ratios. As shown in Table XV, Appendix H, the assistant directors and administrative dietitians consistently perceived 'patients fed (midnight census)/labor hours', 'patients served/trays prepared', 'patient satisfaction (food temp)/delivery time', and 'labor hours expended/labor hours scheduled' as being more useful than did the other groups. It is plausible that directors delegated certain measurement, food delivery, and scheduling responsibilities to the assistant directors and administrative dietitians and thus were not so concerned with these measures. Also, the generalist dietitians may have been less responsible for these areas than the administrative dietitians and assistant directors.

Dietitians which have been ADA members between 16 and 20 years were most likely to perceive 'overall patient satisfaction/type of communication' as useful ($p=.0484$). Those who had been members for less than

five years were least likely to see this ratio's usefulness. This could possibly be due to the lack of experience of the new members and thus the inability for them to see the importance of communication. It could, however, be that new members communicate more efficiently than the other members and thus have less problems with patient dissatisfaction arising from poor communication.

Institutional Data Variables

There was a significant association between the type of hospital control and the ratios perceived as useful, as shown in Table XVI, Appendix H. Dietitians from investor-owned (for profit) and federal government hospitals were the most likely groups to perceive 'meals delivered/hostess labor hours' and 'patients served/trays prepared' as useful. Possibly these groups were the most likely to employ hostesses. Those from federal government and nongovernment, not-for-profit hospitals were the most likely groups to observe usefulness of 'overall patient satisfaction/# items in menu selection'. Dietitians from hospitals which provided general care chose 'correct trays served/labor hours', 'overall patient satisfaction/# items in menu selection', and 'overall patient satisfaction/type of communication' as more useful than did those dietitians from special care hospitals (Table XVII, Appendix H). Perhaps the general hospitals had more problems with incorrect trays due to the variety of diets whereas special care hospitals prepared certain types of trays more consistently. This may also have been a reason that general care hospitals perceived the number of items in the menu selection as important.

Dietitians from hospitals with foodservices not contracted to a food or management company perceived 'overall patient satisfaction/type of communication' ($p=0.0757$) to be more useful twice as often as did the other dietitians. One-third of the respondents working in hospitals whose tray delivery was the responsibility of the foodservice department perceived 'meals delivered/hostess labor hours' as important ($p=0.0063$). Although the definition of hostess for the questionnaire did not include tray delivery, perhaps hostesses were the ones responsible for tray delivery in those hospitals. When the nursing department was responsible for tray delivery, however, only 14 percent of the dietitians saw its usefulness.

Two-thirds of the dietitians in foodservices with galleys instead of traylines found 'labor hours expended/labor hours scheduled' useful. Thirty-nine percent of the dietitians with no galleys perceived this ratio as useful ($p=0.0149$). Perhaps absenteeism and/or overtime was more critical when food was served from galleys.

Significant relationships emerged between several ratios and the number of trayline supervisors employed in the foodservice. When the hospital had only one trayline supervisor assigned to the trayline, 'correct trays served/labor hours' ($p=0.0223$) was chosen as useful. In contrast, when there was either one or more than one trayline supervisor in the institution that same ratio and 'meals delivered/hostess labor hours' ($p=0.0934$) appeared more useful than when there were no supervisors. Those previous ratios were not perceived as useful when no trayline supervisors were employed.

There was a significant association between number of dietary hostesses employed by hospitals and the ratios dietitians and supervisors

perceived as useful (Table XVIII, Appendix H). Those participants from hospitals with more than nine hostesses perceived 'patients fed (midnight census)/labor hours', 'meals delivered/hostess labor hours', 'patients served/ trays prepared', and 'employee longevity/intensity of training' as more useful than did the other participants. 'Meals served/hostess labor hours' would obviously be important to the hospitals with more than nine hostesses. Also, the hostesses could have accessible information on how many patients actually received trays. Those from hospitals with one to three dietary hostesses more frequently chose 'menu modifications/# items in menu selection' as useful, probably because the hostesses had the responsibility of making some of the menu modifications.

A significant relationship appeared between means of communicating diet changes and various ratios (Table XIX, Appendix H). There was a positive association between the use of the memo and perceived usefulness of 'patients served/trays prepared', 'menu modifications/# items in menu selection', and 'employee longevity/intensity of training'. Personnel in these hospitals may communicate about patients served and menu modifications by using memos. A positive association also existed between use of dietary hostesses for communication and perceived usefulness of 'correct trays served/labor hours' and 'menu modifications/# items in menu selection', probably because hostesses could obtain those output and outcome measures. There was, however, negative associations between use of the pneumatic tube and perceived usefulness of 'overall patient satisfaction/type of communication', and cathode ray tube and '# employee complaints/type of communication'. Perhaps the efficiency of the pneumatic tube and cathode ray tube increased satisfaction, and thus eliminated the need for these ratios. A negative association was also

noted between use of infolink and 'patients fed (midnight census)/labor hours' and 'employee longevity/intensity of training'.

Over one-half the participants which obtained a patient census only one time per day perceived 'correct trays served/labor hours' as useful ($p=0.0712$). Approximately one-third of the participants who collected the census more than once per day saw this ratio as useful. Although it may seem more logical that those who took only a midnight census would use that figure in a productivity ratio, perhaps those are the dietitians who found a notable discrepancy in the census number and the correct trays served. Thus, they were the ones who collected further data for more accuracy.

A significant association emerged between methods of tray service evaluation and three ratios (Table XX, Appendix H). Dietitians who used cost trends were more likely to perceive 'employee longevity/intensity of training' and 'labor hours expended/labor hours scheduled' as useful. Information on labor hours expended would easily arise from cost trend data. Those who did not use cost/revenue measures were more likely to perceive 'patients fed (midnight census)/labor hours' as useful. Those who used indicators were most likely to feel that 'correct trays served/labor hours' and 'labor hours expended/labor hours scheduled' were useful. The perceived usefulness of '# employee complaints/type of communication' was positively associated with the use of indexes.

Significant associations appeared between ratios which the respondents perceived as useful and selected personal and institutional characteristics. The researcher, therefore, failed to accept H_2 .

Ratios Ranked as Five Most Important

H_3 : There is no significant difference in the partial factor

productivity measures (ratios) perceived as one of the five most important by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables seen on pages 3 and 4.

Personal Data Variables

Significant associations occurred between route to ADA membership and two ratios. Dietitians which had qualified for ADA membership through a Master's degree plus experience were most likely to rank 'patients served/trays prepared' and were the least likely group to rank '# employee complaints/type of communication'. The dietitians who had completed a CUP or an internship preferred '# of employee complaints/type of communication' (Table XXI, Appendix I). Dietitians with Master's degrees and experience had possibly found effective ways of communicating with employees to prevent employee complaints, or they simply did not believe that this ratio was important.

Institutional Data Variables

A very significant association existed between 'patient satisfaction (food temp)/delivery time' ($p=0.0009$) and hospital control. Three-fourths of the dietitians from federal government controlled hospitals chose this ratio as one of the most important. It was chosen by over half the dietitians from investor-owned hospitals and by one-third of the dietitians from nongovernment, not-for-profit institutions. Only one-fifth of the non-federal government dietitians chose his ratio. Since many federally funded hospitals include Veteran's Administration hospitals and/or skilled care institutions, many of the patients are long term. Therefore, patient satisfaction would be very important.

Significant relationships emerged between tray delivery and 'meals delivered/hostess labor hours' ($p=0.0752$) and 'employee longevity/intensity of training' ($p=0.0228$). When the foodservice department was responsible for tray delivery, the dietitians were more likely to rank the ratio including hostess hours than if the nursing department had that responsibility. Hostesses may have been responsible for tray delivery in hospitals where foodservice departments were responsible. Those dietitians from hospitals where the nursing department performed tray delivery, however, were more likely to rank 'employee longevity/intensity of training' ($p=0.0228$) as one of the most important, but no reason is evident. 'Patients fed (midnight census)/labor hour' ranked higher among dietitians from hospitals with no traylines ($p=0.0410$) than among the other groups. Eighty-eight percent of that group ranked it as important. Also, as would be expected (hospitals with no traylines may have had galleys instead), 79 percent of the dietitians with galleys ranked this ratio ($p=0.0385$). The simplicity of this ratio may have lended itself to hospitals which measured productivity in each separate galley. The group with galleys also preferred 'meals delivered/hostess labor hours' ($p=0.0268$) more than did those with traylines.

The number of trayline supervisors seemed to affect the amount of importance placed on 'meals delivered/hostess labor hours' ($p=0.0983$). None of the dietitians without supervisors ranked this ratio while 17 percent of the dietitians with one supervisor ranked it, but this was not highly significant.

Table XXII, Appendix I, shows a relationship between the number of hostesses and the ranking of several ratios. When one to three hostesses were employed, 43 percent of the dietitians ranked 'patients served/trays

prepared'. 'Menu modifications/# items in menu selection' ranked more frequently among dietitians in hospitals with more than nine hostesses than when less than nine were employed. Again, both of those ratios included information which may have been readily available to the hostesses. Dietitians from hospitals with no hostesses ranked 'employee longevity/intensity of training' more often than did the other groups.

Significant associations existed between various means of communication and ratios as shown in Table XXIII, Appendix I. There was a positive relationship between the use of telephones and the ranking of 'overall patient satisfaction/type of communication' and 'labor hours expended/labor hours scheduled' and between the use of hostesses as a means of communication and 'patients served/trays prepared' and 'menu modifications/# items in menu selection'. Those using the cathode ray tube were less likely to rank '# of employee complaints/type of communication' than those who did not. The efficiency of cathode ray tubes may have decreased number of employee complaints so significantly that this ratio was not needed. Those who did not use an intercom system or chart were more likely to rank 'patient satisfaction (food temp)/delivery time'. A negative association also appeared between the use of the pneumatic tube and 'correct trays/labor hours' and the infolink and 'employee longevity/ intensity of training'.

A significant association existed between time of patient census and several ratios (Table XXIV, Appendix I). Dietitians from hospitals with a once per day census ranked 'correct trays served/labor hours' and 'patients served/trays prepared' more frequently than did others. When the census was obtained three times per day, 'overall patient satisfaction/ type of communication' ranked more favorably. 'Number of employee

complaints/type of communication' ranked less frequently among dietitians who obtained a patient census twice per day than among others. It can be inferred from this result that when proper communication is utilized and patients are satisfied there is also a trend for diminished employee complaints.

The methods of tray service evaluation which hospitals used were significantly associated with ratios which ranked as most important (Table XXV, Appendix I). Those who did not use cost trend analysis were more likely to rank 'correct trays served/labor hours', and 'meals delivered/ hostess labor hours', while those who used cost trend analysis more frequently ranked 'overall patient satisfaction/# of items in menu selection' and 'employee longevity/intensity of training'. Due to the type of information available from cost trends, these results may seem idiopathic. Since a cost trend analysis could provide information on labor hours but not on satisfaction and turnover, however, maybe these ratios were ranked because the information is not collected in any other way.

When cost/revenue was tracked, 'overall patient satisfaction/type of communication' was chosen most while those who did not use this method ranked 'employee longevity/intensity of training' more frequently. A positive correlation existed between use of indicators and ranking of 'patient satisfaction (food temp)/delivery time', 'patient satisfaction/# items in menu selection', 'patients satisfaction/type of communication', and 'menu modifications/#items in menu selection', all of which consist of outcome indicators. The use of indexes and the use of productivity ratios also showed positive associations with 'employee longevity/intensity of training'.

Significant associations emerged between ratios which the respondents ranked as one of the five most important ratios and selected personal and institutional characteristics. The researcher, therefore, failed to accept H_3 .

Summary

Communication appeared more important to the dietitians who had been members of ADA from 16 to 20 years. Of the two ratios incorporating communication, those dietitians used one and perceived the other as useful more than others did.

Several ratios were chosen more frequently by dietitians from hospitals with hostesses. Logically, dietitians in hospitals with more than nine hostesses used and perceived as useful 'meals delivered/hostess labor hours' more than did others. In institutions which employed hostesses, dietitians used, perceived as useful, and ranked 'menu modifications/# items in menu selection' more frequently. Hostesses probably obtained and/or facilitated menu modifications and therefore supplied the data to operationalize this ratio. When hostesses communicated diet changes, dietitians also perceived these two ratios as more useful and ranked them more frequently. Another ratio which dietitians with hostesses perceived as more important and ranked more frequently than those without hostesses was 'patients served/trays prepared'. Since hostesses may have served the meals in some hospitals, one can easily see why this ratio may have been important.

Two other comparisons of means of communicating diet changes and ratio perceptions exist. Dietitians using a cathode ray tube perceived '# of employee complaints/type of communication' less useful and ranked

it less often than did others. Also, those using infolink perceived 'employee longevity/intensity of training' as less useful and ranked it less often than did non-infolink groups. One may postulate that particular ratios may be best suited to particular types of communication tools, but there is insufficient evidence in this research to support those relationships.

Those who obtained a patient census only once per day perceived as more useful and ranked more frequently the ratio 'correct trays served/labor hours' than did those who obtained a census more often. Perhaps this was because of the discrepancy between midnight census and trays actually needed.

Dietitians who used indicators to evaluate performance of traylines used and ranked all ratios which included patient satisfaction more frequently than did dietitians not using indicators. This is understandable since patient satisfaction was the indicator which the sample used the most. Another ratio which the group using indicators used and perceived as useful more often than did others was 'labor hours expended/labor hours scheduled'.

CHAPTER V

SUMMARY, RECOMMENDATIONS, AND IMPLICATIONS

The purpose of this study was to identify partial factor productivity measures to monitor productivity in foodservice. The focus of the research was on trayline service in health care institutions. This study illustrates that each segment of the foodservice organization can be measured. It also provides an example of opportunities available to foodservice managers and management dietitians to monitor many aspects of productivity in their systems. Measurement in many areas can ensure that one unit is not optimizing at the expense of other units in the production process (Militzer, 1980).

Research questions included what types of partial factor productivity measures were currently being used in hospital traylines, what measures were perceived as useful for the traylines, and finally, which partial factor productivity measures were considered most important in monitoring trayline productivity. Those questions were directed to a random sample of dietitians with management responsibilities in health care delivery systems. The probability that a relationship existed between the measures chosen for each research question and selected personal and institutional variables was also analyzed. The three hypotheses postulated for the research were as follows:

H₁: There is no significant difference in the partial factor productivity measures (ratios) utilized by dietitians with management

responsibilities in health care delivery systems based on selected personal and institutional variables.

H₂: There is no significant difference in the partial factor productivity measures (ratios) perceived as useful by dietitians with management responsibilities in health care delivery systems based on selected personal and institutional variables.

H₃: There is no significant difference in the partial factor productivity measures (ratios) perceived as the five most important by dietitians with managerial responsibilities in health care delivery systems based on selected personal and institutional variables.

Researchers in the 1920's noted that labor time was very important in foodservice. It was not until the 1950's, however, that it became a major topic of interest. Most of the literature up to the 1970's reported solely types of work measurement studies. As productivity became an issue of great concern in the 1970's, several researchers and foodservice managers began the attempt to measure and improve productivity.

Many of those research endeavors revealed that the term 'productivity' had not yet been clearly defined. Investigations of productivity measurement, as defined in this study, have become more common only during the last decade. Relatively few researchers have performed productivity measurement studies in foodservice.

It may be necessary, however, for foodservice managers to understand and practice organization development and change strategies before productivity measurement and improvement can actually be incorporated into their systems. The knowledge of the concepts presented in the literature and in this research can only be a beginning to the operationalization of productivity measurement and improvement.

Two preliminary studies which utilized action research occurred prior to this research. They incorporated participative involvement strategies to identify several partial factor productivity measures which foodservice institutions could use. The research design was the descriptive status survey. The research instrument, a questionnaire, included 19 personal and institutional demographic variables and a list of eleven partial factor productivity ratios and other measures which were identified in one of the preliminary studies. The questionnaire was sent to a random sample of 906 dietitians with management responsibilities in health care delivery systems. The sample was homogeneous with the group who identified the partial factor productivity measures in one of the preliminary studies.

Frequency distribution and chi square were used to describe the sample and test the hypotheses. Standard statistical procedures were performed using the Statistical Analysis System (Barr & Goodnight, 1972).

Demographic Description of the Sample

The response rate of the identified sample invited to participate in the study was 22 percent (N=199) of which 17.7 percent (N=160) were usable. Over half of the respondents had the position title of director and around two-thirds had completed their Bachelor's degree. Three-fifths of the respondents became ADA members via the internship route and over half of them had been members for 10 years or less.

Forty-nine percent of the institutions were nongovernment, not-for-profit hospitals. Most of the hospitals provided general medical services and 80 percent of the hospitals had from 100-999 beds.

Institutions, rather than food or management companies, managed the majority of the foodservices. Patient census was obtained only once per day in over half of the hospitals. The method of evaluating patient satisfaction was divided with half the hospitals using surveys, and almost half doing the evaluation verbally. Over one-third of the hospitals performed the evaluations either weekly, monthly, or quarterly.

Three-fourths of the respondents replied that their assembly and distribution were centralized and that the nursing department was responsible for delivering trays in over half the institutions. Eighty-two percent of the foodservice systems reported having only one trayline while 80 percent had from one to four trayline supervisors. Two-thirds of the participants employed one or more hostesses to carry menus and visit patients.

Most respondents used the telephone and memo for diet change communication. Forty-one percent of the training programs for new trayline personnel lasted from one to three days.

The majority of the foodservice systems used cost trends and indicators to evaluate tray service. Less than half the respondents used indexes and productivity ratios and less than one-third used cost/revenue ratios.

Evaluation of the Hypotheses

The determination of chi square values enabled associations to be seen between the variables: 1) Ratios currently being utilized in health care delivery systems and selected personal and institutional variables, 2) Ratios perceived as useful by respondents for measuring productivity in health care delivery systems and selected personal and

institutional variables, and 3) Ratios ranked as the five most important in measuring productivity of health care delivery systems and selected personal and institutional variables.

Results that were significant in the hypotheses appear in Tables XXVI through XXVIII, Appendix J. A simple description of which personal and institutional variables were significantly related in each of the hypotheses is shown in Table VIII on the following pages.

Recommendations

Based on the findings of this study, the following recommendations are offered:

1. There is a need for additional research in all areas of food-service to determine perceptions, knowledge, and practices of food-service managers and management dietitians regarding productivity measurement and improvement. Variables could include those in the present research, how practices differ between dietitian administrators and non-dietitian administrators, their educational emphases, and others. Additional research is needed by hospital stratification (i.e., size, type, service system, etc.) so that recommendations for productivity improvement could result. To facilitate statistical analysis, demographic questions on the survey should be multiple choice with no open-ended questions.

2. Productivity measurement and productivity research may be a basis for continuing education conferences and workshops for dietitians, administrators, and other persons in management positions in dietary/nutrition departments. Also, the development of learning modules by ADA on techniques of productivity measurement could be useful. Without

TABLE VIII

Description of Ratios Significantly Related by Selected Variables

Personal & Institutional Variables	H ₁ : Ratio Utilization	H ₂ : Ratios Perceived as Useful	H ₃ : Ratios Ranked
PERSONAL:			
Position title		$\frac{\text{patients served}}{\text{trays prepared}}$	
		$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$	
		$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$	
Years of ADA membership	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$	
	$\frac{\# \text{ employee complaints}}{\text{type of communication}}$		
	$\frac{\text{employee longevity}}{\text{intensity of training}}$		
Route to ADA membership	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$		$\frac{\text{correct trays served}}{\text{labor hours}}$
			$\frac{\# \text{ employee complaints}}{\text{type of communication}}$
INSTITUTIONAL:			
Hospital control		$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{patients served}}{\text{trays prepared}}$
		$\frac{\text{patients served}}{\text{trays prepared}}$	
		$\frac{\text{overall patient satisfaction}}{\# \text{ items in menu selection}}$	
Services provided		$\frac{\text{correct trays served}}{\text{labor hours}}$	
		$\frac{\text{overall patient satisfaction}}{\# \text{ items in menu selection}}$	
		$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$	

TABLE VIII (Continued)

Personal & Institutional Variables	H ₁ : Ratio Utilization	H ₂ : Ratios Perceived as Useful	H ₃ : Ratios Ranked
Hospital size	$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$		
Foodservice management	$\frac{\text{patient fed (midnight census)}}{\text{labor hours}}$	$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$	
Foodservice system	$\frac{\text{overall patient satisfaction}}{\# \text{ items in menu selection}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$		
Tray delivery		$\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{overall patient satisfaction}}{\text{type of communication}}$	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$
Number of traylines	$\frac{\text{correct trays served}}{\text{labor hours}}$ $\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$ $\frac{\# \text{ employee complaints}}{\text{type of communication}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$		$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$
Number of galleys	$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$ $\frac{\# \text{ employee complaints}}{\text{type of communication}}$	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$ $\frac{\text{meals delivered}}{\text{hostess labor hours}}$
Number of trayline/ galley upervisors	$\frac{\text{menu modification}}{\# \text{ items in menu selection}}$	$\frac{\text{correct trays served}}{\text{labor hours}}$ $\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$
Number of hostesses	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$ $\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{patients served trays prepared}}{\text{trays prepared}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$ $\frac{\text{patients served trays prepared}}{\text{trays prepared}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$	$\frac{\text{patients served trays prepared}}{\text{trays prepared}}$ $\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$

TABLE VIII (Continued)

Personal & Institutional Variables	H ₁ : Ratio Utilization	H ₂ : Ratios Perceived as Useful	H ₃ : Ratios Ranked
Means of Communication: Cathode ray tube	$\frac{\# \text{ employee complaints}}{\text{labor hours expended}}$	$\frac{\# \text{ employee complaints}}{\text{type of communicaton}}$	type of communication
Telephone	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$		$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$
			$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$
Memo	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{patients served}}{\text{trays prepared}}$	
		$\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$	
		$\frac{\text{employee longevity}}{\text{intensity of training}}$	
Intercom	$\frac{\text{correct trays served}}{\text{labor hours}}$		$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$
	$\frac{\text{patients served}}{\text{trays prepared}}$		
	$\frac{\text{employee longevity}}{\text{intensity of training}}$		
Chart	$\frac{\text{meals delivered}}{\text{hotess labor hours}}$		$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$
Hostess		$\frac{\text{correct trays served}}{\text{labor hours}}$	$\frac{\text{patients served}}{\text{trays prepared}}$
		$\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$	$\frac{\text{menu modifications}}{\# \text{ items in menu selection}}$

TABLE VIII (Continued)

Personal & Institutional Variables	H ₁ : Ratio Utilization	H ₂ : Ratios Perceived as Useful	H ₃ : Ratios Ranked
Nurse	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{patients served}}{\text{trays prepared}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$		
Pneumatic tube		$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$	$\frac{\text{correct trays served}}{\text{labor hours}}$
Infolink		$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$	$\frac{\text{employee longevity}}{\text{intensity of training}}$
Patient census	$\frac{\text{menu modifications}}{\text{\# items in menu selection}}$	$\frac{\text{correct trays served}}{\text{labor hour}}$	$\frac{\text{correct trays served}}{\text{labor hour}}$ $\frac{\text{patients served}}{\text{trays prepared}}$ $\frac{\text{overall patient satisfaction}}{\text{type of communication}}$ $\frac{\text{\# employee complaints}}{\text{type of communication}}$
Time of patient satisfaction evaluation	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$		
Tray Evaluation: Cost trend	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$ $\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$ $\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$ $\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$ $\frac{\text{\# employee complaints}}{\text{type of communication}}$ $\frac{\text{overall patient satisfaction}}{\text{type of communication}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$	$\frac{\text{correct trays served}}{\text{labor hours}}$ $\frac{\text{meals delivered}}{\text{hostess labor hours}}$ $\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$
Cost/revenue	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$	$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$ $\frac{\text{employee longevity}}{\text{intensity of training}}$

TABLE VIII (Continued)

Personal & Institutional Variables	H ₁ : Ratio Utilization	H ₂ : Ratios Perceived as Useful	H ₃ : Ratios Ranked
Indicators	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$	$\frac{\text{correct trays served}}{\text{labor hours}}$	$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$
	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$	$\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$
	$\frac{\text{patient satisfaction (food temp)}}{\text{labor hours}}$		
	$\frac{\text{patient satisfaction}}{\text{\# items in menu selection}}$		
	$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$		$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$
	$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$		$\frac{\text{menu modifications}}{\text{\# items in menu selection}}$
Indexes	$\frac{\text{meals delivered}}{\text{hostess labor hours}}$	$\frac{\text{\# employee complaints}}{\text{type of communication}}$	$\frac{\text{employee longevity}}{\text{intensity of training}}$
	$\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$		
Productivity ratios	$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$		$\frac{\text{employee longevity}}{\text{intensity of training}}$
	$\frac{\text{patients served}}{\text{trays prepared}}$		

understanding of the concept of productivity, interest to implement a productivity measurement and improvement program cannot emanate.

3. Productivity research is need in terms of communication needs and impacts of new communication technology for dietary departments (i.e., impact of communicating dietary changes by computer instead of telephone on efficiency and effectiveness).

4. Dietitians need to be receptive to research in the field and commit themselves to organization development (OD) in all areas of management, including productivity measurement and improvement.

5. Researchers should obtain top management commitment from health care and other institutional foodservice systems to perform action research in the area of productivity measurement and improvement; then they should operationalize the measures, assist in getting the programs started, be available for consultation, and facilitate revision until the programs are stable and meeting the needs of the individual organizations.

6. Dietitians need to perform action research and participative group strategies with their employees to develop a productivity measurement and improvement program which is suited to their particular operation. The following actions could achieve this objective:

- a. obtaining a group consensus of areas which could be improved,
- b. determining which measure would best discover whether or not improvements were made, (patient census once midnight may not be even near an accurate count of meals served or patients per meal).
- c. operationalizing those measures and making results

- known to the group,
- d. instilling enthusiasm in the group to facilitate continuation of the overall concept of productivity improvement and the program at hand.

Figure 8 illustrates another method to meet this objective.

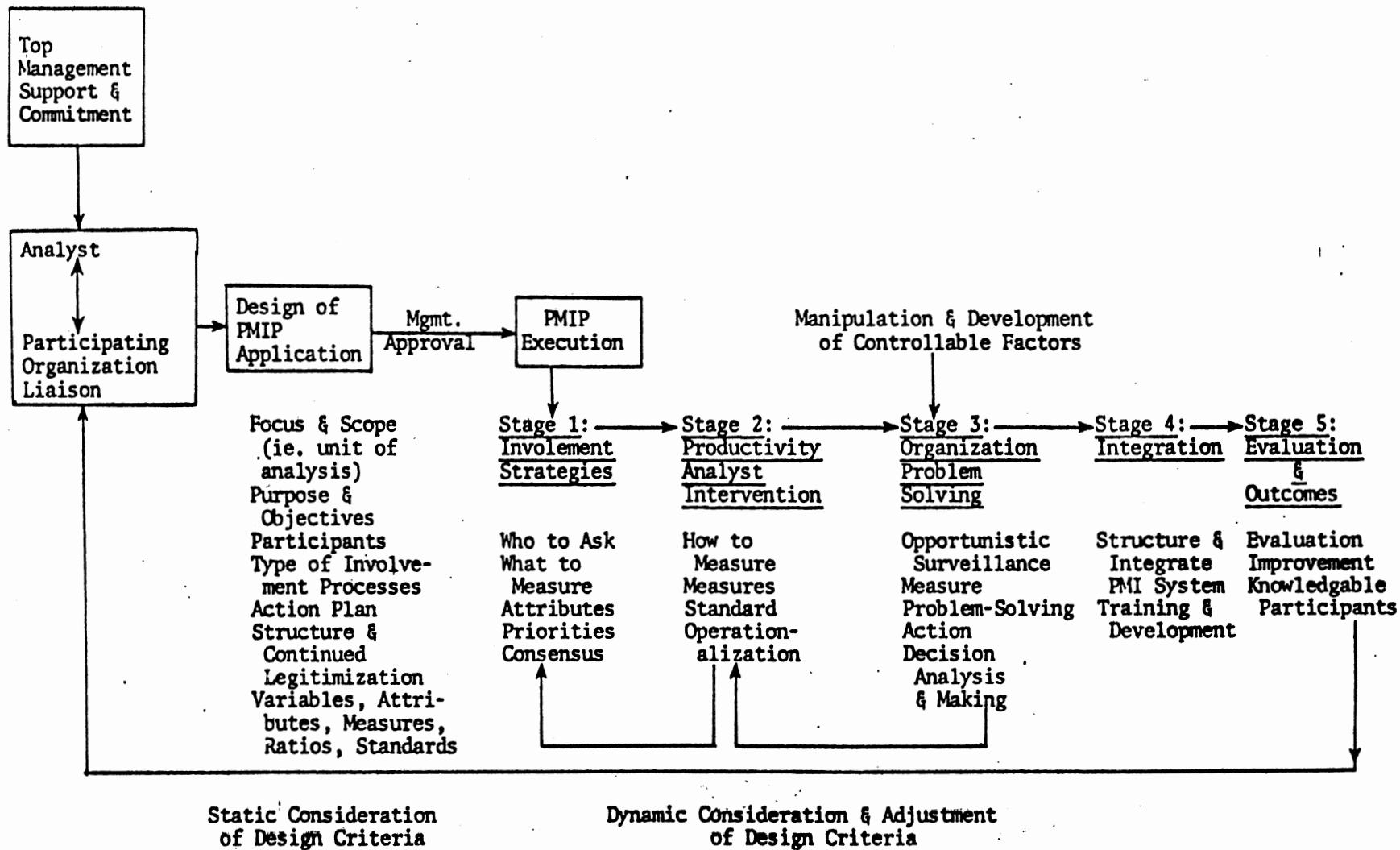
Implications

A majority of dietitians in management positions have generalist backgrounds and may not have acquired skills required to effectively "perform the specialized functions to manage increasingly complex food-service systems" (Position paper on the administrative dietitian, 1975, p. 478). Since many management competencies are not mastered at the undergraduate level, dietitians may wish to pursue those skills in graduate and/or continuing education.

Dietitians may be spending a disproportionate amount of time monitoring cost trends (which may be useless unless inflation indexes are utilized) instead of measuring productivity. If improvement efforts are implemented in dietary/nutrition departments, evaluation measures should also be available to monitor improvements and their cost effectiveness.

The results of this study strongly indicate that patient satisfaction with food temperature and delivery time are very important measurements. Perhaps these are major concerns in many institutions and warrant further investigation for more efficient and effective means of delivering trays.

This research hopefully provided the reader with a list of productivity ratios and other measures which could be operationalized in various organizations. In addition to those measures, the utilization



Source: Sink (1980a), p. 5.

Figure 8. Design and Execution Process for Development of Productivity Measurement and Improvement Process

of a participative group strategy may provide the identification of other ratios to be used for that particular system. It is further anticipated that in the future, as dietitians and foodservice managers become more cognizant with the concept of productivity, comparisons of effectiveness and efficiency will be incorporated into the data collection systems of dietary/nutrition departments. As competency on this subject expands, more elaborate productivity programs may evolve.

Hopefully, awareness of productivity was achieved by the participants and nonrespondents who read the questionnaire. Dietitians who may only relate productivity to manufacturing or industry need to realize that it applies to service organizations as well.

SELECTED BIBLIOGRAPHY

- A.D.A. Reports. Position paper on recommended salaries and employment practices for members of the American Dietetic Association. Journal of the American Dietetic Association, 1981, 78, 62-73.
- Barrett, F. Clocking productivity at Howard Johnson's. Fast Food, 1973, 72(2), 83-84.
- Beard, V. Work sampling as a method of evaluating a school food service training program. Unpublished master thesis, University of Tennessee, 1970.
- Bennis, W.G. Organization Development: Its Nature, Origins, and Prospects. Reading, Mass.: Addison-Wesley Publishing Co., 1969.
- Bennis, W.G., Benne, K.E., Chin, R., and Corey, K.E. The Planning of Change. New York: Holt, Rinehart and Winston, Inc., 1976.
- Blaker, G.G. and Harris, K.W. Labor hours and costs in house and food departments. Journal of the American Dietetic Association, 1952, 28, 429-434.
- Borsenik, F.D. Measuring productivity: analysis of current measurement systems, Fast Food, 1973, 72(2), 77-82.
- Brimeyer, J.L., and Sink, D.S. Productivity measurement and improvement--a participative approach. Ohio Cities and Villages, December, 1979, pp. 11-13.
- Brown, N.E. A conceptual framework for analysis of a nursing home service system and procedures for measurement of selected variables related to labor time. Unpublished doctoral dissertation, Iowa State University, 1972.
- Brown, R.M. Estimating dietary labor by use of work modules. Hospitals, 1969, 43(20), 103-106.
- Burley, K.R. Productivity and performance. Paper presented at the Annual Meeting of the Society for the Advancement of Food Service Research, University of Houston, October 29, 1976.
- Coffey, C.A., Spragg, D., McCune, E., and Gordon, G. Continuous time study shows how scheduled time is spent. Hospitals, 1964, 38(4), 96; 103-104, 106.

- Corey, S.M. Action Research to Improve School Practices. New York: Columbia University, 1953.
- Delbecq, A.L., Van de Ven, A.H., and Gustafson, D.H. Group Techniques for Program Planning. Glenview, Ill.: Scott, Foresman and Company, 1975.
- Donaldson, B. Labor hours in the dietary department. Journal of the American Dietetic Association, 1957, 33, 1239-1243.
- Donaldson, B. Work sampling simplifies work scheduling. Modern Hospital, 1961, 96(3), 144; 148-149.
- Donaldson, B. Effective utilization of hospital dietary personnel. (Terminal Report, Public Health Service Grant No. HM 00198) Unpublished. Institution Management Lab., University of Wisconsin, 1967a.
- Donaldson, B. Institution Management Lab. Methodology Manual for Work Sampling. Madison: University of Wisconsin, 1967b.
- Drucker, P.F. Managing in Turbulent Times. New York: Harper & Row, 1980.
- French, W., and Bell, C.H. Organizational Development. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1978.
- Freshwater, J.F. A productivity index for cafeteria workers. Cornell Hotel and Restaurant Administration Quarterly, 1967, 8(2), 33-38.
- Freshwater, J.F., and Bragg, E.R. Improving food service productivity. Cornell Hotel and Restaurant Administration Quarterly, 1975, 15(4), 12-18.
- Halter, E., and Donaldson, B. Labor in the dietary department. Journal of the American Dietetic Association, 1957, 33, 583-587.
- Hamlin, J. Productivity improvement: An organized effort. Proceedings 1978 Spring Annual Conference. A.I.I.E., Toronto, Canada, May, 1978, pp. 223-228.
- Industrial Engineering Newsfront. Study says management to blame for U.S. productivity decline. Industrial Engineering, 1980, 12(11), 14.
- Isaac, S., and Michael, W.B. Handbook in Research and Evaluation. San Diego: Robert R. Knapp, Publishers, 1971.
- Joseph, M.L., and Joseph, W.D. Research Fundamentals in Home Economics. Redondo Beach, CA: Plycon Press, 1979.
- Kaud, Faisal A. Food service department productivity studies in ten hospitals. Paper presented at the Seminar on Food Service Depart-

ment Productivity: Cost Control Approaches, American Hospital Association, Kansas City, MO, November 13, 1980.

- Kent, J.S., and Ostenso, G.L. Productivity relationships of hospital dietary departments. Journal of the American Dietetic Association, 1965, 45, 104-109.
- Kerlinger, F.N. Foundation of Behavioral Research. New York: Holt, Rinehart and Winston, Inc, 1973.
- Klein, C.R. A technique for measuring labor productivity in hospital dietetic departments. Unpublished master thesis, University of Missouri, 1978.
- Kotschevar, L.H. Labor shortage intensified by high turnover, low productivity. Hospitals, 1972, 46(9), 76.
- Lebeau, J.N. Comparison of labor time estimates for the performance of specific food production tasks. Unpublished master thesis, Iowa State University, 1974.
- MacDonald, J.M. Labor productivity and labor force growth. National Food Review, Spring 1981, pp. 24-26.
- Maclean, H.H. Staffing patterns of two food service areas of a hospital training center for mentally retarded. Unpublished master thesis, Oregon State University, 1975.
- Mali, P. Improving Total Productivity. New York: John Wiley and Sons, 1978.
- Martenev, A.L., and Ohlson, M.A. Work sampling of dietary staff. Journal of the American Dietetic Association, 1964, 45, 212-217.
- Mateicka, B. Activity analysis of work sampling of dietitians at a university medical center. Unpublished master thesis, University of Wisconsin, 1968.
- Matthews, M.E., and Waldvogel, C.F., Mahaffey, M.J., and Zemel, P.C. Master standard data quantity food production code: macro elements for synthesizing labor time. Journal of the American Dietetic Association, 1978, 72 612-617.
- Militzer, K.H. Macro vs. micro input/output ratios. Management Review, 1980, 69, 8-14.
- Miner, J.B. Theories of Organization Behavior. Hinsdale, Ill.: The Dryden Press, 1980.
- Montag, G.M., McKinley, M.M., and Klinschmidt, A.C. Predetermined motion times--a tool in food production management. Journal of the American Dietetic Association, 1964, 45, 206-211.

- Morris, W.T. Implementation Strategies for Industrial Engineers. Columbus: Grid Publishing, Inc., 1979.
- Mundel, M.E. Motion study in food service. Journal of the American Dietetic Association, 1956, 32, 546-547.
- Newburn, R.M. Measuring productivity in organizations with unquantifiable end-products. Personnel Journal, 1972, 51, 655-657.
- Noland, M.S., and Steinberg, R. Activities of therapeutic dietitians--a survey report. Journal of the American Dietetic Association, 1965, 46, 477-481.
- Ostenso, G.L., and Donaldson, B. Effective use of hospital dietary labor resources. Hospitals, 1966, 40(14), 127-132.
- Position paper on the administrative dietitian. Journal of the American Dietetic Association, 1975, 67, 478-479.
- Productivity measurement still a cottage industry. Restaurant Institutions, 1981, 89(11), 12.
- Rosow, J.M. Solving the human equation in the productivity puzzle, Management Review, 1977, 66(8), 40-43.
- Ruf, K., and Matthews, M.E. Production time standards. Hospitals, 1973, 47(9), 82-90.
- Schell, M.L. Work sampling--an approach to a problem. Journal of the American Dietetic Association, 1962, 41, 456-458.
- Schell, M.L., and Korstad, P.L. Work sampling study shows division of labor time. Hospitals, 1964, 38(2), 99-102.
- Sink, D.S. Development and implementation of productivity measurement systems with emphasis on interorganizational relationships. Unpublished dissertation, Ohio State University, 1978.
- Sink, D.S. Designing successful productivity management systems. Paper presented at the 35th ASQC Midwest Conference Transactions, Tulsa, 1980a.
- Sink, D.S. A methodology for evaluating organization development techniques and strategies. Paper presented at the Fall Annual Conference, A.I.I.E. Proceedings, Minneapolis, December, 1980b.
- Sink, D.S. Executing a successful productivity improvement effort: a review of approaches taken by over twenty different firms in the U.S. Paper presented at the Productivity Management Conference, Tulsa, May, 1981a.
- Sink, D.S. Personal communication, Oklahoma State University, Stillwater, April, 1981a.

- Sink, D.S., and Mize, J.H. The role of planning and its linkage to action in productivity management. Unpublished manuscript, 1981b. (Available from D.S. Sink, 322 EN, Oklahoma State University, Stillwater, OK, 74078).
- Smith, N. Development of standard times for work modules used in quantity food production. Unpublished master thesis, University of Tennessee, 1972.
- Stewart, W.T. Productivity measurement at the firm level. Manufacturing Productivity Frontiers, 1981, 6-11.
- Stokes, M. Productivity and personnel--getting the best from both. The Stokes Report, 1981, 1(4), 7.
- Strauss, G., and Sayles, L.R. Personnel--The Human Problems of Management. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1980.
- Sumanth, D.J. Productivity indicators used by major U.S. manufacturing companies; The results of a survey. Industrial Engineering, 1981, 13, 70-73.
- Szilagyi, Jr., A.D. Management and Performance. Santa Monica, CA: Goodyear Publishing Co., Inc., 1981.
- Thurrow, L.S. Accelerating productivity. Economic Issues for FY81, (U.S. House of Representatives, Committee on the Budgets, 96th Congress, Second Session) Washington, D.C.: U.S. Government Printing Office, 1966).
- Tuthill, B.H., and Donaldson, B. Labor in the dietary department. A study of ten hospitals. Journal of the American Dietetic Association, 1956, 32, 541-545.
- Validating an instrument for measuring labor productivity in hospital dietetic departments. Manuscript submitted for publication, 1981.
- Waldvogel, C.F., and Ostenso, G.L. Labor time per portion and volume in food service. Journal of the American Dietetic Association, 1977a, 70, 178-180.
- Waldvogel, D.F., and Ostenso, G.L. Quantity food production labor time. Master standard data code. Journal of the American Dietetic Association, 1977b, 70, 172-177.
- Weisman, Craig. Peer comparison of productivity and costs. Paper presented at the seminar on Food Service Department Productivity: Cost Control Approaches, American Hospital Association, Kansas City, MO, November 13, 1980.
- Wells, J.S. Participation, costs, and man-hour production in selected school food service programs. Unpublished master thesis, Texas Woman's University, 1972.

- Western Washington Dietetic Association. A comparative study of amounts and costs of food and labor. Report of Administrative Section. Journal of the American Dietetic Association, 1934, 9, 382-389.
- Whyte, W.F., and Hamilton, E.L. Action Research for Management. Homewood, Ill.: Irwin-Dorsey, 1964.
- Wilson, M. Determining work loads by random ratio-delay sampling. Journal of the American Dietetic Association, 1956, 32, 719-723.
- Woolley, J.H. Productivity relationships of hospital dietary departments. Unpublished master thesis, University of Wisconsin, 1964.
- Young, S.L. What's needed for productivity improvement. Production Engineering, 1981, pp. 34-37.
- Yung, L.S., Matthews, M.E., Johnson, V.K., and Johnson, N.E. Variables affecting productivity in food service systems of nursing homes. Journal of the American Dietetic Association, 1981, 78, 342-348.
- Zolber, K.K., and Donaldson, B. Distribution of work functions in hospital food systems. Journal of the American Dietetic Association, 1970, 56, 39-45.

APPENDIXES

APPENDIX A

WORK MEASUREMENT REVIEW

Work Sampling

Work sampling was used in food service for three purposes: 1) classification of functional areas and operations; 2) productivity measurement of personnel; and 3) establishment and definition of normal performance standards (Donaldson, 1967a). Donaldson's (1967b) work sampling methodology manual classified the functional areas and operations to help categorize work functions and was well accepted by many researchers.

Work sampling was also used to calculate labor cost/activity, simplify work schedules, show objectives being met, and show effectiveness of utilization of time, money, equipment, and personnel (Donaldson, 1961) which gave feedback and controlled on-going operations (Zolber & Donaldson, 1970). Other applications of work sampling included evaluating and determining training needs (Beard, 1970), pinpointing areas of improvement (Schell, 1962), providing a quantitative basis for administration to analyze old systems and change to new ones, and predicting activity models for future food systems (Zolber & Donaldson, 1970). Other researchers chose to use comparative surveys where comparisons of time spent in each activity were made between several food service operations (Freshwater, 1967; Maclean, 1975; Schell, 1962; Schell & Korstad, 1964; Wilson, 1956).

Performance ratios were obtained effectively by work sampling. Productivity indices for each classification of work in hospital dietary departments were acquired by work sampling. According to work sampling studies done by Marteney and Ohlson (1964), Mateicka (1968), and Noland and Steinberg (1965), the activities of therapeutic dietitians were similar even when there were differences in their work environments.

Their findings indicated the need for changes in work delegation and scheduling patterns before dietitians could effectively perform their major objectives.

Beard (1970) compared the time spent in each function before and after work simplification training in a school food service by performing work sampling. Due to a substantial improvement in processing, transportation, cleaning, and personal delays, Beard concluded that the training was beneficial in increasing productivity.

In the correlational research done by Yung, Matthews, Johnson, and Johnson (1981), the purpose was to identify which factors effect quantitative productivity. The study investigated "the extent to which variations in one factor correspond with variations in one or more other factors" (Isaac & Michael, 1971, p. 14).

Maclean's (1975) work sampling study in an institution for the mentally retarded compared and analyzed worker utilization and productivity in the serving area of two cottages. The workers in one cottage consisted of only regular employees while the other cottage used resident workers also. With the results of the study, Maclean concluded that regular workers produced more work in less time when resident helpers were not present. She suggested that residents be given the foodservice experience, but that the time be considered as planned learning experiences instead of as a source of labor.

Time Study

Since time studies are designed to measure short cycle repetitive work, they were not used to a great degree in foodservice. There are, however, several cases in which they were used to compare actual time to a predetermined time (Lebeau, 1974; Montag et al., 1964).

The implementation of time study as a sole measurement was found in only one research paper (Coffey et al., 1964). The paper described continuous time study of 100 direct-labor employees in a medical center dietary department, with the purpose being to determine the relationship of labor time in general work categories. A comparison of the productivity index of labor minutes/meal between this study and work sampling studies done in other hospitals was shown. The results of the comparison of four studies were within 1.4 minutes per meal range.

Time and Motion

Time and motion studies were utilized when one activity at a time was to be measured. Smith (1972) used time and motion analysis in a study to determine the best method to make roast beef sandwiches. Mundel (1956) used menomotion study to minimize direct labor effort and time in a foodservice.

Predetermined Motion Times

Several researchers used master standard data (MSD) to calculate standard times for specific recipes (Montag et al., 1964; Ruf & Matthews, 1973; Waldvogel & Ostenso, 1977a, 1977b). MSD proved to be fairly accurate in Montag's study when compared to time study in making pudding and rolls. She indicated that MSD may be a feasible tool for measuring certain repetitive tasks.

Waldvogel and Ostenso (1977b) developed part of the MSD productivity codes. It was based on activities done to produce single-item entree's and proved to be adaptable for general use. Their conclusion stated that it was possible that the MSD productivity code would be the

framework for the establishment of a universal quantity food production code. The code would help management determine and optimize relationships between time per portion and total volume produced for each menu item utilized (Waldvogel & Ostenso, 1977a).

Matthews (1978) grouped basic MSD elements to form macro elements. The feasibility of adapting this method of predetermining production time to quantity food service was shown.

Conceptual estimation was the last type of predetermined motion time sited in the literature. Times were determined based on judgments of experienced panelists. Those on the panel were given descriptions of the tasks, then they estimated the time it would take to complete those tasks (Brown, 1972). Although Lebeau (1974) found several problems with this method, he stated that with certain revisions it could prove to be feasible.

APPENDIX B
ORGANIZATIONAL CHART

COUNCIL ON PRACTICE
THE AMERICAN DIETETIC ASSOCIATION
ORGANIZATIONAL CHART

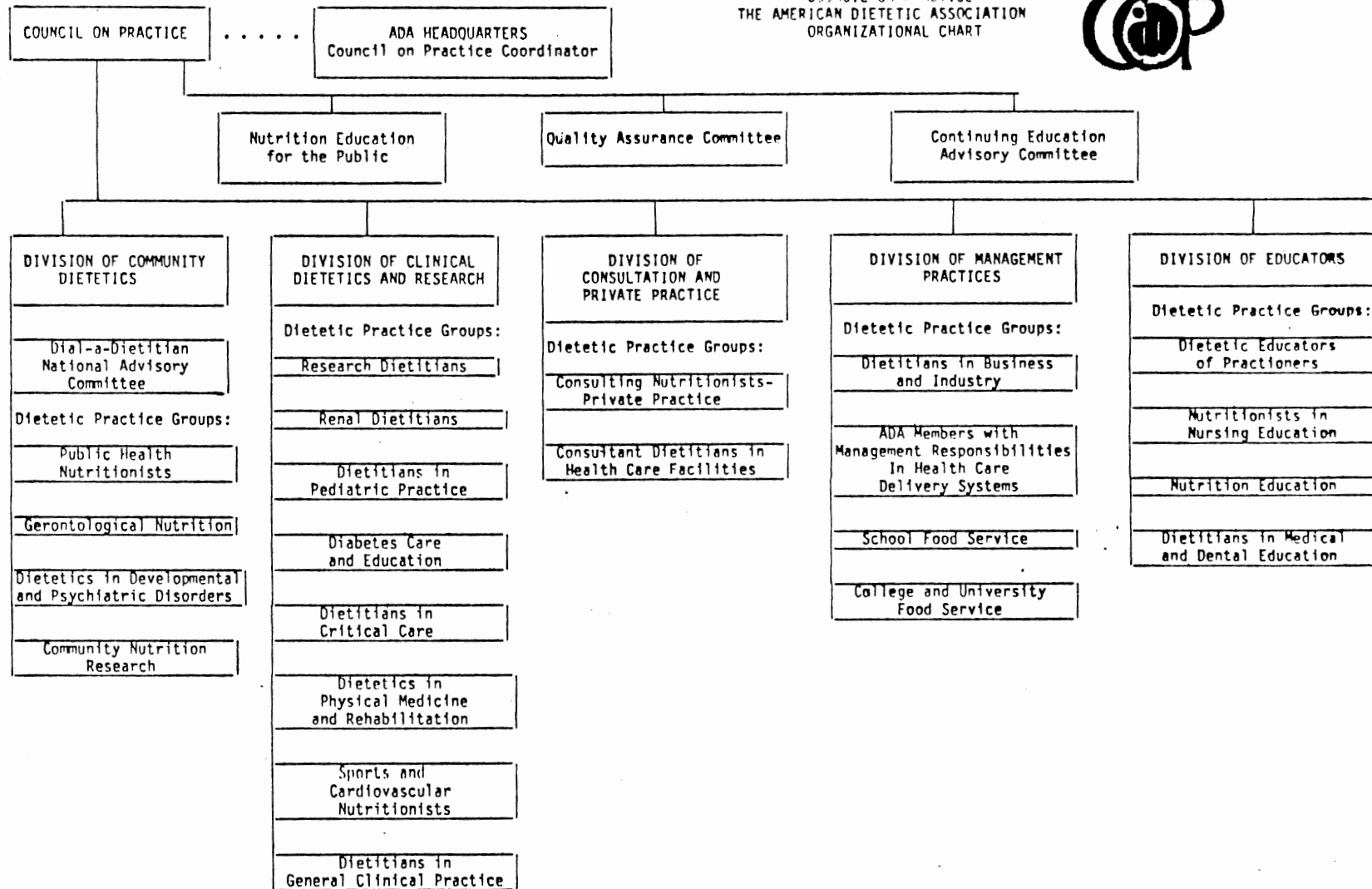


Figure 9. Organizational Chart of the Council on Practice of the American Dietetic Association

APPENDIX C

NOMINAL GROUP TECHNIQUE

A Brief Description and Set of
Instructions for Application of the
Nominal Group Technique

D. Scott Sink, Ph.D.
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School of Industrial Engineering and Management
and
Research and Development Director
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Oklahoma State University

NOMINAL GROUP TECHNIQUE

The Nominal Group Technique is simply one of many structured group processes that have been designed and developed. The Nominal Group Technique (NGT) is a special-purpose technique useful for situations where individual judgements must be tapped and combined to arrive at decisions which cannot be calculated by one person. It is a problem-solving or idea-generating strategy, not typically used for routine meetings.

NGT was developed by Andre L. Delbecq and Andrew H. Van de Ven in 1968. It was derived from social-psychological studies of decision conferences, management-science studies of aggregating group judgements, and social-work studies of problems surrounding citizen participation in program planning. Since that time, NGT has gained extensive recognition and has been widely applied.

NGT takes its name from the fact that it is a carefully designed, structured, group process which involves carefully selected participants in some activities as independent individuals, rather than in the usual interactive mode of conventional groups. It is a well developed and tested method which is fully presented in the work of Delbecq, Van de Ven, and Gustafson, 1975. This book is strongly recommended.

The NGT is a four-phase process. The participants are physically present in groups of 8 to 12 and the session is controlled by a process consultant or facilitator.

Following an opening introduction in which the purposes of the session are outlined, participants are presented a carefully worded task statement. The group members are then instructed to write on the sheet provided, their responses to the task statement. The first phase is called silent generation and typically takes about 10 minutes.

Next comes the round robin phase. The facilitator calls on participants one-by-one to state one of the responses he or she has written. Participants may pass at any time and join in on any subsequent round. A participant may propose only one item at a time and either the facilitator or an assistant records each item as it is presented. The only discussion allowed is between the facilitator and the participant who proposes the item and it is limited to seeking a concise rephrasing for ease of recording. Participants are encouraged to add items to their personal list should new ones occur to them during the round robin.

The third phase is called clarification. Once all items have been recorded, the facilitator goes over each, one at a time, to ascertain that all participants understand the action programs which have been

recorded. Any participant may offer clarification or may suggest combination, modification, deletion, etc. of items, however, no evaluation is permitted.

In phase four, voting and ranking, participants are provided with eight blank cards. Each must now select eight items and write them, one per card. Participants then spread the eight cards such that they can be viewed simultaneously. Working alone, each selects the single most preferred item and writes the score 8 on the card, and puts it aside. Of the remaining seven cards, the least preferred item is selected and scored 1. This iterative process continues until all are scored.

During the period of time before the next activity, the scores are recorded, beside the items, on the clarified list. The resulting consensus items are discussed and the group will now be prepared for future steps.

TASK STATEMENT

The task statement is simply the carefully worded task that you wish the participants to respond to during the structured group session. It is perhaps the most critical element of the NGT process. The task statement should be simple and direct. Strive for clarity and then test the statement on a few members of the organization to detect potentially confusing or biasing expressions.

COMPOSITION

Selection of the appropriate participants for structured group activities is another crucial activity. The quality of the eventual results is directly dependent upon the degree to which you select the right personnel to participate.

LOGISTICS

Group effectiveness is strongly related to the facilitator's ability to operate the method smoothly and confidently. The following minimum logistic preparations are essential:

- a) the facilitator should have a detailed agenda of group activities, resources needed, and time durations for the group activities.
- b) a trained assistant should be available whose duty is simply to record participants on large sheets of flip-chart type paper, to display these sheets, to tabulate and record votes, and to provide participants with necessary materials.
- c) A packet should be prepared for each participant containing the materials needed for the session. For example the packet should contain:

-a card displaying the participant's name on both sides,

folded so as to stand on the table

- a sheet of 8½ x 11 paper with the task statement typed at the top
 - sufficient number of 3" x 5" cards for ranking and voting (a convenience would be to have them in packets of the correct number one for each participant)
 - marking pens for the assistant
 - masking tape to be used for taping up sheets of measures
- d) A conveniently located conference room with a table that will comfortably accommodate the group while writing. Excessively large or small rooms are distracting. The room must permit the taping of the large sheets on the wall.
 - e) one or two large display easels on which the pads (approximately 27" x 34") can be mounted.
 - f) the group task should be written on one of the large sheets of paper.
 - g) the following simple visual aids, while not essential, have proven very useful in communicating quickly and effectively with participants:

a display of the steps in the nominal group technique.

a series of displays to supplement the facilitator's introduction to the purpose and method for the group session.

Part of the logistics is the actual execution of the nominal group technique. Execution of the nominal group technique involves the four basic steps mentioned earlier in addition to an introduction and conclusion. All participants should be made aware, in the facilitator's opening statement to the group, of the nature of the task, process, etc.

PROCESS INSTRUCTIONS

The method begins with a carefully prepared statement of the group task. This task statement appears at the top of a sheet of paper in each participant's packet and on a large sheet in front of the group. The facilitator should familiarize the participants with the process and attempt to make them feel comfortable and at ease with what will transpire in the next two hours. The facilitator should discuss very briefly at least the following items:

- a) the purpose of the session and the importance of the process in order to effectively and efficiently complete the task.

- b) the steps of the nominal group method.
- c) how the results will be used, next steps, etc.

The facilitator reads the task statement aloud. If the facilitator is asked what is meant by the task statement, it is probably best to avoid introducing bias by giving examples. Instead the facilitator might ask several of the participants to give their interpretation of the task statement. Additionally, the facilitator may simply ask several participants to directly respond to the task statement, that is, to provide a response. If the responses appear to be coincident with the objective and the remainder of the participants appear to have now grasped the task, it is time to proceed to the first basic step of the nominal group technique, silent generation. The process of forcing the participants to clarify the task statement themselves is called self priming, and has been found to be very effective.

The group members are instructed to write on the sheet provided, their responses to the task statement. The first phase is called silent generation and typically takes about 10 to 15 minutes.

Both the facilitator and the assistant should write during this period. Even if a majority of participants appear to stop writing before 10 minutes has elapsed, the period should not be shortened. If some talking occurs the facilitator should tactfully ask for cooperation in permitting others to think through their ideas.

Like each of the steps in the nominal group process, silence is purposefully designed. Research has shown that for creation, generation, and production of ideas, individuals are more effective than groups. Thus for this portion of the session, individual behavior is sought. Silent generation focuses attention on a specific task, frees the participants from distractions, and provides an opportunity to think through their ideas rather than to simply react to the comments of others. In this sense, it is a proactive search process which yields contributions of greater quality and variety. Participants are motivated by the tension of seeing those around them working hard at the group task. They are forced to attend for a longer time to the task, rather than rushing immediately to consideration of the first which is suggested to the group. They are freed from all of the inhibiting effects of the usual face-to-face interaction of unstructured groups. Judgement of ideas cannot take place during this early and crucial portion of the group process.

At the end of the silent generation period, the facilitator interrupts the silent generation process. It should be emphasized that there is no need to stop generating and that the listing process which is about to begin may well lead to additional ideas. The facilitator calls on participants one-by-one to state one of the responses written. Participants may pass at any time and may also join in on any subsequent round. A participant may propose only one item at a time and either the facilitator or an assistant records each item as it is offered. The only discussion allowed is between the facilitator and the participant

who proposed the item and it is limited to seeking a concise rephrasing for ease of recording. As each participant responds, the facilitator repeats verbatim what has been said, and the assistant records the concise phrase on a sheet. As mentioned earlier, the consultant may assist rephrasing in order to maintain consistency and achieve session goals as long as the basic idea or concept is not altered. This phase goes on until all the ideas generated by the group are listed and displayed.

The round robin phase, described above, permits the leader to establish an atmosphere of acceptance and trust. He does not unduly rephrase or evaluate the contributions and they are equally and prominently displayed before the group. Leader openness and non-evaluative behavior are essential here. Each idea and each participant receive equal attention and acceptance. There is little opportunity for the process to be dominated by strong personalities, inhibited by possible sanctions or conflicts, or suppressed by status differences. The process separates ideas from their authors and permits conflicting and incompatible ideas to be explicitly tolerated. It provides written record of the group's efforts as a basis for any next steps.

The third phase is call clarification. Once all the items have been recorded, the facilitator goes over each one in order to ascertain that all participants understand the item as it has been recorded. Any participant may offer clarification or may suggest combination, modification, deletion, etc. of items, however, evaluation should be avoided. It is not required nor is it expected that the author provide the clarification. The consultant moves rapidly from one measure to the next, keeping up the pace of the process. During this step the underlying logic behind items may be thought out, there may be some expressions of differences of opinion, and the group may conclude that some items can be eliminated or combined because they duplicate others.

Pace is important to this step and the facilitator's job is to keep the group moving rapidly through the list of items. While in this phase the group is more like an interacting one, the facilitator seeks to control lengthy discussions, arguments, and "speech making." Again, the effort is to separate ideas from their authors, to clarify rather than to evaluate, and to insure full opportunities for participation.

It is important to point out that the clarification aspect of the nominal group technique is perhaps the primary determinant for the resultant quality of the list of items. If there is a great deal of overlap from item to item and if there is ambiguity on the part of the group members as to exactly what each item means, the next step which involves voting and ranking will be invalid. Experience has indicated that a certain amount of combination is necessary. The facilitator should be sensitive to any hierarchy of items represented on each list. This hierarchy has to do with the breadth, scope or generality of the item itself. The list should contain items of uniform scope, breadth or generality in order for voting and ranking to be "successful." Just exactly how this is attained will depend upon the group and the facilitator. After experiencing a session you will begin to recognize the characteristics

of this issue. Some find that careful combination or subtle clarification during the round robin session will help to alleviate clarification difficulties which often occur.

The fourth phase, voting and ranking, provides the participants with an opportunity to select the most important items and to rank those items. The participants are asked to remove the blank 3" x 5" cards from the packets. The number of blank cards can vary. Each participant is asked to select eight most important items from the list displayed before them. Typically the list will contain 20-30 items. To avoid any confusion in handling their judgements, they are asked to write the items out, in abbreviated fashion, in the center of the blank card. They are also asked to write the sequential list number of the item in the upper left hand corner of the card. When all have completed this step, they are asked to spread the eight cards out in front of them and to follow the next steps designed to rank and weigh the items.

"From the eight cards, choose the most important item, write the number 8 with a circle around it in the lower right hand corner of the card, and set the card aside."

Another way of phrasing this which may assist some in deciding which is most important is as follows:

"Which of the eight items would you use to guide future actions relative to this topic if you could only use one?"

The ranking process continues:

"From the remaining seven cards, choose the least important item, write the number 1 with a circle around it in the lower right hand corner of the card, and set the card aside."

Another way of phrasing this which may assist some in deciding which is the least important is as follows:

"If you could only use six items of the seven in front of you, which one item would you just as soon drop off?"

The ranking process continues:

"From the remaining six cards, choose the most important item, write the number 7 with a circle around it in the lower right hand corner of the card, and set the card aside."

The process continues in this outside in ranking fashion, most important--least important--most important--etc., until all the cards have been ranked.

At this point of the process, tabulation of the votes needs to take place, the facilitator has three alternatives:

- a) invite the participants to take a ten minute break (possibly for refreshment) while he and the assistant tabulate and display the results.

- b) invite the participants to watch while the tabulation process takes place.
- c) invite the participants to fill out a brief questionnaire which has been prepared by the coordinator for the specific purpose of; evaluating the reaction of the participants to the process, obtaining suggestions from the participants as to the next steps, evaluation on the part of the participants as to likelihood of implementation, etc.

The tabulation process involves sorting the cards by sequential item number from the original list and recording the weights given to each. Later on, sums or averages can be computed, but for immediate discussion, individual weights should be displayed to communicate the number of weights given and their variation.

This step serves the fundamental purpose of permitting the participants to express their individual evaluations of the items in a way which is free of social pressure. It provides a constructive method for dealing with conflicts, and leads to a clear expression of whatever degree of consensus there may be with respect to the importance of terms generated. It provides a strong sense of closure, a feeling of group accomplishment, and a high level of interest for future steps in the activity being examined. While participants may not individually agree with the final product, they will typically support it as the achievement of their group.

The session closes with a brief discussion of results of the voting process in which the facilitator emphasizes those items for which there is strong consensus. He may ask the group if they would like to eliminate from further consideration any items which received no votes. Again, this should not be done unless there is complete consensus. No participant should be overridden here. At this point the facilitator may wish to comment on the future steps or to discuss the groups feelings about future action.

REFERENCES FOR FURTHER READING:

1. Delbecq, A.L., Van de Ven, A.H., and Gustafson, D.H., Group Techniques for Program Planning: A Guide to Nominal Group and Delphi Processes, Scott, Foresman & Co., 1975.
2. Group Development, Leland P. Bradford (ed.), University Assoc., 1974.
3. Huse, E.F., Organization Development and Change, West Publishing, Co., 1975.
4. Problem Analysis and Decision Making, Kepner-Tregoe, Inc., Princeton Research Press, 1973.

APPENDIX D
QUESTIONNAIRE

HOW CAN WE MEASURE PRODUCTIVITY?



GENERAL INFORMATION

Please provide the following information in the spaces below:

1. Position title:

<ul style="list-style-type: none"> <input type="checkbox"/> a. director <input type="checkbox"/> b. assistant director <input type="checkbox"/> c. administrative dietitian <input type="checkbox"/> d. clinical staff dietitian 	<ul style="list-style-type: none"> <input type="checkbox"/> e. generalist dietitian <input type="checkbox"/> f. health care facility consultant <input type="checkbox"/> g. other (please specify) _____
--	---
2. Years of ADA membership: _____ years
3. Level of education:
 - a. Bachelor's degree
 - b. graduate work, degree not complete
 - c. Master's degree
 - d. Doctoral work, degree not complete
 - e. Doctoral degree
4. Route to ADA membership: _____
5. Type of hospital control:
 - a. federal government
 - b. non-federal government (state, county, city)
 - c. nongovernment, not-for-profit (church, other)
 - d. investor-owned, for profit (private, partnership, corporate)
 - e. osteopathic
6. Type of medical service provided:
 - a. general
 - b. special (please specify) _____
7. Hospital size:
 - a. Less than 100 beds
 - b. 100-299 beds
 - c. 300-999 beds
 - d. 1000 beds or more
8. Are your foodservices contracted to a food or management company?
 - a. yes (please specify) _____
 - b. no

9. Which type of food service system best describes your operation?
- ___ a. Conventional Foodservice System--production and service of quality food within one foodservice operation while effectively utilizing all renewable resources.
- b. Assembly-Serve Foodservice System--food products are only procured after a considerable degree of processing; only storage, assembly, heating, and service functions are commonly done within the foodservice operation.
- c. other (please specify) _____
10. Which service system best describes your assembly and distribution of meals?
- _____
11. Delivering trays to the patients is the responsibility of:
- ___ a. foodservice department
- b. nursing department
12. Number of tray lines: _____ or galleys: _____
13. Number of tray line (or galley) supervisors: _____
14. Number of hostesses (persons who carry the menus or visit the patients other than the dietitian): _____
15. How are diet changes communicated to the dietary/nutrition department?
- | | |
|---------------------|---------------------------------|
| a. cathode ray tube | f. hostess |
| b. telephone | g. nurse |
| c. memo | h. pneumatic tube |
| d. intercom | i. Infolink or electrowriter |
| e. chart | j. other (please specify) _____ |
16. Patient census is obtained at:
- ___ a. midnight only
- b. midnight and before lunch
- c. other (please specify) _____
17. Patient satisfaction regarding quality of meals served is determined:
- when: _____
- how & by whom: _____
- how often: _____
18. Intensity of training program for new trayline personnel:
- ___ a. 1-3 days
- b. 1-2 weeks
- c. 2 or more weeks

19. How do you evaluate your tray service now? Please place a check beside any of the methods below in which data is being collected. Then, beside the method(s) you checked, list up to three of the main measures that you actually use.

- ___ a. cost trends (ex.--raw food cost, labor cost, cost of maintenance) 1. _____
2. _____
3. _____
- ___ b. $\frac{\text{cost}}{\text{revenue}}$ 1. _____
2. _____
3. _____
- ___ c. indicators or measures (ex.--absenteeism, turnover, patient satisfaction) 1. _____
2. _____
3. _____
- ___ d. indexes (ex.-- $\frac{\text{labor hours, 1981}}{\text{labor hours, 1980}}$,
 $\frac{\text{raw food costs, July}}{\text{raw food costs, June}}$) 1. _____
2. _____
3. _____
- ___ e. productivity ratios ($\frac{\text{output}}{\text{input}}$)
(ex.-- $\frac{\text{salads prepared}}{\text{salad labor hours}}$) 1. _____
2. _____
3. _____
- ___ f. other (please specify) 1. _____
2. _____
3. _____

INSTRUCTIONS

Please meet with your trayline supervisors and discuss the importance of each ratio in the list provided. (If you do not have a trayline, please include galley supervisors or those people who are very familiar with the function of tray service.) If the group feels the ratio would be helpful in monitoring improvement efforts or evaluating the tray service, please place a check in the appropriate column. We would then like for your group to come to a consensus and rank the five most beneficial ratios you checked. Place a 5 in the space beside the most important, etc. If the ratio is already in use indicate that by placing a check in the other column. Then, if you can think of further measures that would be useful, please list them in the space provided on the next page and indicate where you would insert them in the ranking.

It is very important that you do this with the supervisors. They, as well as the managers, will be the ones who will use the information obtained through this research; therefore, their input is also very important.

PRODUCTIVITY RATIOS

This list was the result of a pilot study performed at a 777-bed hospital in October, 1981. The administrative dietitian and four trayline supervisors met with the researcher to discuss important outputs, inputs, and improvement ideas for the tray service. They were then asked to list ratios that could help them measure tray service productivity.

Instructions:

- 1) Check the ratios which you believe would be valuable in measuring how effective and efficient your tray service is and which would change over time to reflect improvements as they occur.
- 2) Pick out the top 5 according to importance with 5 being most important.
- 3) Check the ratios you are actually using now.

Could be useful	Rank	Use now	Could be useful	Rank	Use now	
			$\frac{\text{patients fed (midnight census)}}{\text{labor hours}^1}$			$\frac{\text{overall patient satisfaction}^3}{\text{\# items in menu selection}}$
			$\frac{\text{correct trays served}}{\text{labor hours}}$			$\frac{\text{overall patient satisfaction}^3}{\text{type of communication}^4}$
			$\frac{\text{meals delivered}}{\text{hostess}^2 \text{ labor hours}}$			$\frac{\text{menu modifications}^5}{\text{\# items in menu selection}}$
			$\frac{\text{patients served}}{\text{trays prepared}}$			$\frac{\text{\# of employee complaints}}{\text{type of communication}}$
			$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$			$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$
						$\frac{\text{employee longevity}}{\text{intensity of training}^6}$

¹Unless otherwise stated, refers to labor hours spent in tray service

²Person passing/collecting menus

³Data collected by evaluation form

⁴How diet order changes are communicated to dietary department (memo, telephone, etc.)

⁵Write-ins or additions

⁶Type and/or length of training

Please list other ratios that you feel would be useful in your trayline service, then indicate how you would rank those ratios relative to the top five you have just chosen in No. 2 (example--between 1 and 2).

Other comments:

Thank you very much!

APPENDIX E

COVER LETTER AND POSTCARD



Oklahoma State University

Department of Food, Nutrition and Institution Administration

STILLWATER, OKLAHOMA 74078
(405) 624-5039

November 20, 1981

Dear Colleague:

Within the past decade foodservice administrators have become increasingly interested in productivity measurement and improvement strategies. For my Master's thesis, I would like to do a study on productivity measurement of trayline service in hospital dietary/nutrition departments. No judgments will be made on your practice; we will merely identify measures that the survey participants cite as important to evaluate productivity and monitor improvement efforts in their service systems.

Productivity is defined as reaching the highest level of performance with the least expenditure of resources. Improving productivity is a worthwhile and constant goal of good management. Currently, there are very few measures that can be used in dietary departments that can evaluate whether or not improvements are indicated. There is a definite need for additional knowledge of productivity measurement. The answers cannot be found in the literature and hopefully the information collected would be of value to you and other dietary department administrators.

One way to measure productivity is to use a ratio of quantity of outputs (results of the work done) to quantities of inputs (resources used). An example of a productivity measure for a dietary department is $\frac{\text{meals served}}{\text{labor hours}}$. When measured periodically, ratios such as this can be compared to see whether productivity is increasing or decreasing.

This research will survey dietitians and trayline supervisors across the United States. We are asking you to complete the enclosed General Information questionnaire. Then we would like for you and your trayline supervisors to come to a consensus and complete the Productivity Ratios survey form.

We hope you are intrigued with the idea of adding to this professional body of knowledge. If so, we would appreciate your assistance. Forms are coded for research purposes only and results will not be identified with you or your institutions at any time. A self-addressed postage-paid envelope is enclosed for your convenience. We are enthusiastic about the research, and believe it will be of value in dietary/nutrition departments. May we please hear from you by December 7, 1981? If the instructions are not clear, please call us at 405-624-5039.

Sincerely,

Beverly Robertson
Beverly Robertson
Graduate Research Assistant

Lea Ebro
Lea Ebro, Ph.D., R.D.
Associate Professor

December 14, 1981

Dear Colleague:

Three weeks ago we sent you a research questionnaire on productivity measurement of trayline service. We really need your input regarding measures that you are using now or what you perceive as useful ratios.

Kindly complete the blue questionnaire and return it to us at your earliest convenience. If you already have done so, thank you for your assistance.

Sincerely,



Beverly Robertson



Lea L. Ebro, Ph.D., R.D.

APPENDIX F
ENUMERATED RATIOS

Ratio 1

$$\frac{\text{patients fed (midnight census)}}{\text{labor hours}}$$

Ratio 2

$$\frac{\text{correct trays served}}{\text{labor hours}}$$

Ratio 3

$$\frac{\text{meals delivered}}{\text{hostess labor hours}}$$

Ratio 4

$$\frac{\text{patients served}}{\text{trays prepared}}$$

Ratio 5

$$\frac{\text{patient satisfaction (food temp)}}{\text{delivery time}}$$

Ratio 6

$$\frac{\text{overall patient satisfaction}}{\text{\# items in menu selection}}$$

Ratio 7

$$\frac{\text{overall patient satisfaction}}{\text{type of communication}}$$

Ratio 8

$$\frac{\text{menu modifications}}{\text{\# items in menu selection}}$$

Ratio 9

$$\frac{\text{\# of employee complaints}}{\text{type of communication}}$$

Ratio 10

$$\frac{\text{labor hours expended}}{\text{labor hours scheduled}}$$

Ratio 11

$$\frac{\text{employee longevity}}{\text{intensity of training}}$$

Figure 10. Enumerated Ratios

APPENDIX G

CHI SQUARE TABLES OF SIGNIFICANT
ASSOCIATIONS BETWEEN VARIABLES
AND RATIOS (H_1)

TABLE IX
CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN CURRENT
UTILIZATION OF RATIOS BY YEARS OF ADA MEMBERSHIP

Years of ADA Membership	Ratio 3 ^a	Ratio 9	Ratio 11
<5 (N=48)	1/2.08 ^b	5/10.42	5/10.42
6-10 (N=34)	4/11.76	7/20.59	9/26.47
11-15 (N=20)	4/20.00	1/5.00	-
16-20 (N=13)	2/15.38	4/30.77	2/15.38
21-29 (N=25)	3/12.00	3/12.00	3/12.00
>30 (N=16)	-	3/18.75	2/12.50
χ^2	18.277	12.277	15.143
Df	7	7	7
Prob	0.0108	0.0918	0.0342

^a Ratios on p. 123 are enumerated

^b Frequency/Percent

TABLE X
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN
 CURRENT UTILIZATION OF RATIO 5
 BY HOSPITAL SIZE

Hospital Size	Ratio 5 ^a
< 100 (N=25)	15/60.00 ^b
100-299 (N=55)	18/32.73
200-999 (N=72)	28/38.89
≥ 1000 (N=7)	5/71.43

$\chi^2 = 9.429$ Df = 4 Prob = 0.0512

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XI
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS CURRENTLY
 UTILIZED BY NUMBER OF TRAYLINES

Number of Traylines	Ratio 2 ^a	Ratio 3	Ratio 8	Ratio 9	Ratio 11
0 (N=9)	-	-	4/44.44 ^b	1/11.11	1/11.11
1 (N=131)	27/20.61	11/8.40	22/16.79	18/13.74	15/11.45
>1 (N=19)	5/26.32	3/15.79	7/36.84	4/21.05	5/26.32
χ^2	6.563	11.665	10.914	6.482	9.439
Df	3	3	3	3	3
Prob	0.0872	0.0086	0.0122	0.0904	0.0240

^a Ratios are enumerated on page 123

^b Frequency/Percent

TABLE XII

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS CURRENTLY
UTILIZED BY NUMBER OF HOSTESSES

Number of Hostesses	Ratio 3 ^a	Ratio 8
0 (N=46)	1/2.17 ^b	7/15.22
1-9 (N=100)	9/9.00	20/20.00
>9 (N=14)	5/35.71	7/50.00
χ^2	14.256	8.009
Df	2	2
Prob	0.0008	0.0182

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

TABLE XIII

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS CURRENTLY
UTILIZED BY MEANS OF COMMUNICATING DIET CHANGES

Means of Communication	Ratio 2 ^a	Ratio 3	Ratio 4	Ratio 10	Ratio 11
Use Telephone				40/48.78 ^b	
Do not use				25/32.05	
χ^2				4.638	
Df				1	
Prob				0.0313	
Use of Memo		3/4.69			
Do not use		12/12.50			
χ^2		2.759			
Df		1			
Prob		0.0967			
Use chart		3/25.00			
Do not use		12/8.11			
χ^2		3.728			
Df		1			
Prob		0.0535			
Use intercom	4/66.67		4/66.67		3/50.00
Do not use	29/18.33		39/25.32		19/12.34
χ^2	8.072		5.023		6.907
Df	1		1		1
Prob	0.0045		0.0250		0.0086
Use a Nurse		3/23.08	8/61.04		4/30.77
Do not use		12/8.16	35/23.81		18/12.24
χ^2		3.127	8.651		3.456
Df		1	1		1
Prob		0.0770	0.0033		0.0630

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

TABLE XIV

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS CURRENTLY UTILIZED
BY METHODS OF EVALUATION

Method of Evaluation	Ratio 1 ^a	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
Use cost trends (N=128)	69/53.91 ^b			62/48.44	36/28.13	30/23.44		23/17.97	58/45.31	21/16.41
Do not use (N=32)	5/16.53			5/15.63	4/12.50	2/6.25		1/3.13	7/21.88	1/3.13
X ²	15.091			11.324	3.3333	5.073		4.424	5.830	3.808
Df	1			1	1	2		1	1	1
Prob	0.0001			0.0008	0.6079	0.0792		0.0354	0.0158	0.0510
Use cost/revenue (N=43)		8/18.60								
Do not use (N=117)		7/5.98								
X ²		5.896								
Df		1								
Prob		0.0152								
Use indicators (N=108)	55/50.93	14/12.96	52/48.15	36/33.33		29/26.85		49/45.37		
Do not use (N=52)	19/36.54	1/1.92	15/28.85	4/7.69		5/9.62		16/30.77		
X ²	2.923	5.035	5.373	12.308		6.232		3.102		
Df	1	1	1	1		1		1		
Prob	0.0873	0.0248	0.0205	0.0005		0.0125		0.0782		
Use Indexes (N=67)		10/14.93		22/32.84						
Do not use (N=93)		5/5.38		18/19.35						
X ²		4.180		3.795						
Df		1		1						
Prob		0.0409		0.0520						
Use productivity (N=63)	36/57.14		11/17.46							
Do not use (N=97)	38/39.18		32/32.99							
X ²	4.960		4.687							
Df	1		1							
Prob	0.0259		0.0304							

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

APPENDIX H

CHI SQUARE TABLES OF SIGNIFICANT
ASSOCIATIONS BETWEEN VARIABLES
AND RATIOS (H_2)

TABLE XV

CHI SQUARE TABLES SHOWING ASSOCIATION BETWEEN PERCEIVED
USEFULNESS OF RATIOS BY MEANS OF POSITION TITLE

Position Title	Ratio 1 ^a	Ratio 4	Ratio 5	Ratio 10
Director (N=83)	35/42.17 ^b	27/32.50	35/42.17	26/31.33
Assistant Director (N=31)	18/58.06	15/48.39	21/67.74	16/51.61
Administrative Dietitian (N=27)	14/51.85	14/51.85	16/59.26	18/66.67
Clinical Staff Dietitian (N=1)	1/100	1/100	1/100	-
Generalist Dietitian (N=6)	1/16.67	-	2/33.33	2/33.33
Health Care Facility Consultant (N=1)	1/100	1/100	-	1/100
Other (N=10)	8/80.00	5/50.00	8/80.00	4/40.00
χ^2	12.123	13.335	13.766	15.424
Df	7	7	7	7
Prob	0.0966	0.0643	0.0555	0.0309

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XVI

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN PERCEIVED
USEFULNESS OF RATIOS BY HOSPITAL CONTROL

Hospital Control	Ratio 3 ^a	Ratio 4	Ratio 6
Federal Government (N=12)	4/33.33 ^b	8/66.67	8/66.67
Non-federal Government (N=42)	6/14.29	11/26.19	12/28.75
Non-government, not-for profit (N=79)	13/16.46	31/39.24	40/50.63
Investor-owned, for profit (N=23)	9/39.13	11/47.83	10/43.48
Osteopathic (N=2)	1/50	1/50	1/50
χ^2	9.719	10.582	10.305
Df	5	5	5
Prob	0.0836	0.0603	0.0670

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XVII
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN PERCEIVED
 USEFULNESS OF RATIOS BY SERVICE PROVIDED

Type of Service	Ratio 2 ^a	Ratio 6	Ratio 7
General (N=126)	58/46.03 ^b	62/49.21	46/36.51
Special (N=32)	8/25.00	9/28.13	7/21.88
χ^2	6.747	6.985	6.289
Df	3	3	3
Prob	0.0804	0.0724	0.0984

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XVIII

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN PERCEIVED
USEFULNESS OF RATIOS BY NUMBER OF HOSTESSES

Number of Hostesses	Ratio 1 ^a	Ratio 3	Ratio 4	Ratio 8	Ratio 11
0 (N=46)	18/39.13 ^b	4/8.70	12/26.09	10/21.74	24/52.17
1-3 (N=100)	50/50.00	25/25.00	44/44.00	45/45.00	44/44.00
> 9 (N=14)	11/78.57	5/35.14	8/57.14	6/42.86	13/92.86
χ^2	6.721	6.923	6.091	7.372	11.790
Df	2	2	2	2	2
Prob	0.0347	0.0314	0.0476	0.0251	0.0028

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

TABLE XIX

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN PERCEIVED
USEFULNESS OF RATIOS BY MEANS OF COMMUNICATION

Means of Communication	Ratio 1 ^a	Ratio 2	Ratio 4	Ratio 7	Ratio 8	Ratio 9	Ratio 11
Use memo (N=64)			31/48.44 ^b		33/51.56		38/59.38
Do not use (N=96)			33/34.38		28/29.17		43/44.79
X ²			3.164		8.165		3.267
Df			1		1		1
Prob			0.0753		0.0043		0.0707
Use hostesses (N=3)		3/100.0			3/100.0		
Do not use (N=157)		64/40.76			58/36.94		
X ²		4.244			4.692		
Df		1			1		
Prob		0.0394			0.0259		
Use pneumatic tube (N=26)				5/19.23			
Do not use (N=134)				50/37.31			
X ²				3.156			
Df				1			
Prob				0.0756			
Use cathode ray tube (N=8)						-	
Do not use (N=152)						52/34.21	
X ²						4.055	
Df						1	
Prob						0.0441	
Use infolink (N=9)	2/22.22						2/22.22
Do not use (n=151)	77/50.99						79/52.32
X ²	2.813						3.078
Df	1						1
Prob	0.0935						0.0794

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

TABLE XX

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN PERCEIVED USEFULNESS
OF RATIOS BY TRAY SERVICE EVALUATION

Method of Evaluation	Ratio 1 ^a	Ratio 2	Ratio 9	Ratio 10	Ratio 11
Use cost trend (N=128)				59/46.09 ^b	69/53.91
Do not use (N=32)				9/28.13	12/37.50
χ^2				3.382	2.757
Df				.1	1
Prob				0.0659	0.0968
Use cost/revenue (N=43)	15/34.88				
Do not use (N=117)	64/54.70				
χ^2	4.940				
Df	1				
Prob	0.0262				
Use indicators (N=108)		51/47.22		52/48.15	
Do not use (N=52)		16/30.77		16/30.77	
χ^2		3.904		4.338	
Df		1		1	
Prob		0.0482		0.0373	
Use indexes (N=67)			27/40.30		
Do not use (N=93)			25/26.88		
χ^2			3.196		
Df			1		
Prob			0.0738		

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

APPENDIX I

CHI SQUARE TABLES OF SIGNIFICANT
ASSOCIATIONS BETWEEN VARIABLES
AND RATIOS (H_3)

TABLE XXI
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS
 RANKED AS ONE OF THE FIVE MOST IMPORTANT BY
 ROUTE TO ADA MEMBERSHIP

Route to Membership	Ratio 4 ^a	Ratio 9
Internship (N=97)	27/27.84 ^b	26/26.80
Traineeship (N=25)	9/36.00	4/16.00
M.S. plus experience (N=16)	10/62.50	2/12.50
CUP (N=11)	6/54.55	3/27.27
χ^2	10.597	12.456
Df	5	5
Prob	0.0600	0.0291

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XXII
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS
 RANKED AS ONE OF THE FIVE MOST IMPORTANT BY
 NUMBER OF HOSTESSES

Number of Hostesses	Ratio 4 ^a	Ratio 8	Ratio 11
0 (N=46)	14/30.43 ^b	8/17.39	23/50.00
1-3 (N=100)	43/43.00	28/28.00	32/32.00
> 9 (N=14)	2/14.29	7/50.00	3/21.43
χ^2	5.500	5.979	5.876
Df	2	2	2
Prob	0.0639	0.0503	0.0530

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XXIII
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS
 RANKED AS ONE OF THE FIVE MOST IMPORTANT BY
 NUMBER OF HOSTESSES

Means of Communication	Ratio 2 ^a	Ratio 4	Ratio 5	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
Use cathode ray tube (N=8)								
Do not use (N=152)						39/25.66 ^b		
X ²						2.714		
Df						1		
Prob						0.0995		
Use telephone (N=82)				29/35.37			38/46.34	
Do not use (N=78)				13/16.67			23/29.49	
X ²				7.220			4.814	
Df				1			1	
Prob				0.0072			0.0282	
Use intercom (N=6)			2/33.33					
Do not use (N=154)			103/66.88					
X ²			2.882					
Df			1					
Prob			0.0896					
Use hostess (N=3)	3/100				3/100			
Do not use (N=157)	56/35.67				40/25.48			
X ²	5.234				8.319			
Df	1				1			
Prob	0.0222				0.0039			
Use Pneumatic tube (N=26)	5/19.23							
Do not use (N=134)	52/38.81							
X ²	3.638							
Df	1							
Prob	0.0565							
Use infolink (N=9)								
Do not use (N=151)							58/38.41	
X ²							5.423	
Df							1	
Prob							0.0199	
Use Chart (N=12)			5/41.67					
Do not use (N=148)			100/67.57					
X ²			3.361					
Df			1					
Prob			0.0692					

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

TABLE XXIV

CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS
RANKED AS ONE OF THE FIVE MOST IMPORTANT BY
TIME OF PATIENT CENSUS

Patient Census	Ratio 2 ^a	Ratio 4	Ratio 7	Ratio 9
Midnight (N=86)	37/43.02 ^b	38/44.19	15/17.44	19/22.09
Twice/day (N=19)	2/10.53	5/26.32	3/15.79	1/5.26
Three times/ day (N=24)	8/33.33	6/25.00	13/54.17	6/25.00
Other (N=29)	10/34.48	8/27.59	10/34.48	12/41.38
X ²	8.450	8.837	15.780	9.274
Df	4	4	4	4
Prob	0.0764	0.0653	0.0033	0.0546

^a Ratios are enumerated on p. 123

^b Frequency/Percent

TABLE XXV
 CHI SQUARE TABLE SHOWING ASSOCIATION BETWEEN RATIOS RANKED
 AS ONE OF THE FIVE MOST IMPORTANT BY TRAY
 SERVICE EVALUATION

Method of Evaluation	Ratio 2 ^a	Ratio 3	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 11
Use cost trends (N=128)	41/32.03	10/7.81		54/42.19				51/39.84
Do not use (N=32)	16/50.00	8/25.00		8/25.00				7/21.88
χ^2	3.604	7.574		3.186				3.577
Df	1	1		1				1
Prob	0.576	0.0059		0.0743				0.0586
Use cost/revenue (N=43)					16/37.21			10/23.26
Do not use (N=117)					26/22.22			48/41.03
χ^2					3.648			4.296
Df					1			1
Prob					0.0561			0.0382
Use indicators (N=108)			78/72.22	49/45.37	33/30.56	34/31.48		
Do not use (N=52)			27/51.92	13/25.00	9/17.31	9/17.31		
χ^2			6.411	6.137	3.182	3.588		
Df			1	1	1	1		
Prob			0.0113	0.0132	0.0745	0.582		
Use indexes (N=67)								31/46.27
Do not use (N=93)								27/29.03
χ^2								5.007
Df								1
Prob								0.0253
Use productivity ratios (N=63)								29/46.03
Do not use (N=97)								29/29.90
χ^2								4.303
Df								1
Prob								0.0381

^a Ratios are enumerated on p. 123.

^b Frequency/Percent

APPENDIX J

CHI SQUARE TABLES OF SIGNIFICANT
ASSOCIATIONS BETWEEN VARIABLES
AND RATIOS (SUMMARY)

TABLE XXVI (Continued)

Personal and Institutional Variables	Ratio 1 ^a	Ratio 2	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
Chart											
X ²			3.729								
Df			1								
Prob			0.0535								
Nurse											
X ²		3.127		8.651							3.466
Df		1		1							1
Prob		0.0770		0.0033							0.0630
Patient census											
X ²								8.146			
Df								4			
Prob								0.0864			
Time of patient satisfaction evaluation											
X ²										12.346	
Df										7	
Prob										0.0898	
Tray service evaluation											
Cost trend											
X ²	15.091				11.324	33.333	5.073		4.424	5.830	3.808
Df	1				1	1	1		1	1	1
Prob	0.0001				0.0008	0.0679	0.0792		0.0354	0.0158	0.0510
Cost/revenue											
X ²			5.896								
Df			1								
Prob			0.0152								
Indicators											
X ²	2.923		5.035		5.373	12.308		6.232		3.102	
Df	1		1		1	1		1		1	
Prob	0.0873		0.0248		0.0205	0.0005		0.0125		0.0782	
Indexes											
X ²			4.180			3.775					
Df			1			1					
Prob			0.0409			0.0520					
Productivity ratios											
X ²	4.960			4.687							
Df	1			1							
Prob	0.0259			0.0304							

TABLE XXVII
 CHI SQUARE TABLES SHOWING ASSOCIATION OF RATIOS PERCEIVED
 AS USEFUL BY SELECTED PERSONAL AND
 INSTITUTIONAL VARIABLES

Personal and Institutional Variables	Ratio 1 ^a	Ratio 2	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
Personal:											
Position title											
X ²				13.335	13.766					15.424	
Df				7	7					7	
Prob				0.0643	0.0555					0.0309	
Years of ADA membership											
X ²							14.162				
Df							7				
Prob							0.0484				
Institutional:											
Hospital control											
X ²			9.719	10.582		10.305					
Df			5	5		5					
Prob			0.0836	0.0603		0.0670					
Services provided											
X ²		6.747				6.985	6.289				
Df		3				3	3				
Prob		0.0804				0.0724	0.0984				
Foodservice management											
X ²							6.884				
Df							3				
Prob							0.0757				
Tray delivery											
X ²			12.331				4.878				
Df			3				3				
Prob			0.0063				0.0872				
Number of galleys											
X ²										5.928	
Df										1	
Prob										0.0149	
Number of tray-line supervisors											
X ²		7.605	4.743								
Df		2	2								
Prob		0.0223	0.0934								
Number of hostesses											
X ²	6.721		6.923	6.091			7.372			11.790	
Df	2		2	2			2			2	
Prob	0.0347		0.0314	0.0476			0.0251			0.0028	
Means of communication											
Cathode ray tube											
X ²									4.055		
Df									1		
Prob									0.0441		
Memo											
X ²				3.164			8.165			3.267	
Df				1			1			1	
Prob				0.0753			0.0043			0.0707	
Hostess											
X ²		4.244					4.962				
Df		1					1				
Prob		0.0394					0.0259				

TABLE XXVII (Continued)

Personal and Institutional Variables	Ratio 1 ^a	Ratio 2	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
<hr/>											
Pneumatic tube											
X ²							3.156				
Df							1				
Prob							0.0756				
<hr/>											
Infolink											
X ²	2.813										3.078
Df	1										1
Prob	0.0935										0.0794
<hr/>											
Patient Census											
X ²		8.624									
Df		4									
Prob		0.0712									
<hr/>											
Tray service evaluation											
Cost trends											
X ²									3.382	2.757	
Df									1	1	
Prob									0.0659	0.0968	
<hr/>											
Cost/revenue											
X ²	4.940										
Df	1										
Prob	0.0262										
<hr/>											
Indicators											
X ²		3.904								4.338	
Df		1								1	
Prob		0.0482								0.0373	
<hr/>											
Indexes											
X ²								3.196			
Df								1			
Prob								0.0738			

^a Ratios are enumerated on p. 123.

TABLE XXVIII

CHI SQUARE TABLES SHOWING ASSOCIATION OF RATIOS PERCEIVED AS ONE OF THE FIVE MOST IMPORTANT RATIOS BY SELECTED PERSONAL AND INSTITUTIONAL VARIABLES

Personal and Institutional Variables	Ratio 1 ^a	Ratio 2	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
Personal:											
Route to membership											
χ^2	10.597							12.456			
Df	5							5			
Prob	0.0600							0.0291			
Institutional:											
Hospital control											
χ^2				20.737							
Df				5							
Prob				0.0009							
Tray delivery											
χ^2			6.900							9.555	
Df			3							3	
Prob			0.0752							0.0228	
Number of Traylines											
χ^2	8.258										
Df	3										
Prob	0.0410										
Number of galleys											
χ^2	4.283		4.901								
Df	1		1								
Prob	0.0385		0.0268								
Number of trayline supervisors											
χ^2			4.639								
Df			2								
Prob			0.0983								
Number of hostesses											
χ^2				5.500				5.979		5.876	
Df				2				2		2	
Prob				0.0639				0.0503		0.0530	
Means of communication											
Cathode ray tube											
χ^2								2.714			
Df								1			
Prob								0.0995			
Telephone											
χ^2							7.220			4.814	
Df							1			1	
Prob							0.0072			0.0282	
Intercom											
χ^2					2.882						
Df					1						
Prob					0.0896						
Chart											
χ^2					3.301						
Df					1						
Prob					0.0692						
Hostess											
χ^2					5.234			8.319			
Df					1			1			
Prob					0.0222			0.0039			
Pneumatic tube											
χ^2		3.638									
Df		1									
Prob		0.0565									
Infolink											
χ^2									5.423		
Df									1		
Prob									0.0199		

Table XXVIII (Continued)

Personal and Institutional Variables	Ratio 1 ^a	Ratio 2	Ratio 3	Ratio 4	Ratio 5	Ratio 6	Ratio 7	Ratio 8	Ratio 9	Ratio 10	Ratio 11
<hr/>											
Patient census	3.638		8.837			15.780		9.274			
X ²	4		4			4		4			
Df											
Prob	0.0764		0.0653			0.0033		0.0546			
<hr/>											
Tray service evaluation											
Cost trends	3.604	7.574			3.186				3.577		
X ²	1	1			1				1		
Df											
Prob	0.0576	.0059			0.0743				.0586		
<hr/>											
Cost/revenue						3.684			4.242		
X ²						1			1		
Df											
Prob						0.0561			0.038		
<hr/>											
Indicators				6.411	6.131	3.182	3.588				
X ²				1	1	1	1				
Df											
Prob				0.0113	.0132	0.0745	.0582				
<hr/>											
Indexes										5.007	
X ²										1	
Df											
Prob										0.0253	
<hr/>											
Productivity ratios										4.303	
X ²										1	
Df											
Prob										0.0381	

^a Ratios are enumerated on p. 123.

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