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Labor Productivity Standards in Texas School Foodservice Operations

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ABSTRACT

Purpose
Purpose of this research was to investigate utilization of labor productivity standards and variables that affect productivity in Texas school foodservice operations.

Methods
A questionnaire was developed, validated, and pilot tested, then mailed to 200 randomly selected Texas school foodservice directors. Descriptive statistics for variables were calculated. MANOVA and Pearson's Product Moment correlation were used to test relationships between variables affecting labor productivity.

Results
The most common labor standard used was meals per labor hour (MPLH); both MPLH and labor cost as a percentage of revenue (%LABOR) were utilized more frequently in larger size districts. Meal equivalent (ME) conversions were most commonly defined as: 2 breakfasts = ME; $2.00 = ME; and 3 or 4 after-school snacks = ME.

Applications to Child Nutrition Professionals
There was little consistency in use of labor productivity standards and ME conversions in Texas school foodservice operations, which limits their validity for external benchmarking. However, these standards can be used internally to effectively forecast labor needs, aid decisions about productivity, and hold employees accountable for their time.

INTRODUCTION

Productivity in foodservice operations is typically defined as a measure or level of output of goods and services produced in relation to input of resources (Gregoire & Spears, 2007; Payne-Palacio & Theis, 2005). Output can be the number of meals, number of servings, number of customers, or amount of revenue generated, while resources are most likely labor hours or money spent (Martin & Conklin, 1999; Payne-Palacio & Theis, 2005). Currently three labor productivity standards are predominantly used in the school foodservice industry: meals per labor hour (MPLH), labor cost as a percentage of revenue (%LABOR), and servings per labor hour (SPLH). Johnson and Chambers (2000) found that MPLH was the most common performance measure used for external benchmarking in foodservice operations such as schools.

MPLH is determined by dividing the total number of meals or meal equivalents (MEs) the school cafeteria serves daily by the number of labor hours allotted to that school per day (Pannell-Martin & Applebaum, 1999). Payne-Palacio and Theis (2005) suggest that school foodservice operations might produce one meal per every four to five minutes of labor or 10 to 18 meals per labor hour depending on the total number of meals served. Martin and Oakley (2008) state that 16 to 20 meals per labor hour is an appropriate standard for school foodservice . Pannell-Martin (1999) suggested that staffing standards increase or decrease depending on the size of the operation and other factors. She recommended different standards for a conventional system preparing food from raw ingredients onsite than a convenience system using processed foods and disposable dinnerware. Pannell-Martin's standards (1990) were used by the Texas Comptroller's Office as a guide while conducting School Performance Reviews for many years beginning in 1991.

One of the problems with the use of labor productivity standards is that throughout the school foodservice industry, different definitions of a ME are being used. Districts may use one, two, three, or four breakfasts as equal to one ME and a range from $1.00 to $3.00 in a la carte revenue as equal to one ME. Due to variations in defining a "meal", MPLH has different meanings in different school districts.

Labor productivity standards are a very complex issue, and there are many variables that influence the number of labor hours required for a foodservice operation. The literature identifies a total of twelve:

1. Number and length of serving periods (Pannell-Martin, 1999)
2. Number of serving lines in operation during peak times (Kavulla, 1996; Pannell-Martin, 1999)
3. Type of operation such as on-site production vs a central kitchen operation (Pannell-Martin, 1999)
4. Equipment availability (Campbell, 1985; Pannell-Martin, 1999; Schechter, 1997)
5. Offer vs. Serve (effect on number of menu choices and items on a lunch tray) (Mayo & Olsen, 1987)
6. Size of operation and types of meals served (Martin & Conklin, 1999; Pannell-Martin, 1999; Waldvogel & Ostenso, 1977)
7. Variations in menus and menu choices (Knickrehm, McConnell, & Berg, 1981; Yung, Matthews, Johnson, & Johnson, 1981)
8. Length of menu cycle (Knickrehm et al., 1981; Pannell-Martin, 1999)
9. Type of foods purchased (convenience vs non-processed raw food) (Kavulla, 1996; Pannell-Martin, 1999; Schechter, 1997; Yung et al., 1981)
0. Availability of training and number of part-time workers (Campbell, 1985; Cluskey & Messersmith, 1991; Pannell-Martin, 1999; Schechter, 1997; Yung et al., 1981)
1. Work activities of the manager in charge (Pannell-Martin, 1999)
2. Use of disposable tableware (Pannell-Martin, 1999)

Since labor costs make up more than 40% of most school foodservice budgets (Martin & Oakley, 2008), successful school foodservice directors must productively utilize labor.

The purpose of this study was to explore the utilization of labor productivity standards in Texas school foodservice operations. This research sought to determine the most commonly used productivity standards, school foodservice directors' perceptions of the importance of 12 variables affecting labor productivity, and methods used to calculate MEs. An additional objective was to investigate inter-relationships between variables affecting labor productivity and their relationship to school enrollment.

METHODOLOGY

Research Design

All procedures used in this study were approved by the Texas Woman's University Institutional Review Board. A survey questionnaire aimed at determining productivity standards used by school foodservice directors was first developed by the primary researchers. The survey included questions on school demographics, labor standards, variables that may affect labor productivity, and meal equivalent definitions. An expert group of six professionals in the field reviewed the survey, and modifications were made based on their comments. Clarity and readability of questions were assessed through a pilot test with a convenience sample of 15 north Texas foodservice directors. Thirteen responses were received and necessary revisions were made to improve readability and clarity. The revised survey included questions on school district demographics, labor standards, and methods used to determine labor hours needed for a kitchen operation. In addition, participants were asked to rate the importance of twelve variables affecting labor productivity using a 5-point Likert-type scale. For districts utilizing the meals per labor hour standard, participants were also asked to define how they converted breakfasts, a la carte sales, and after school snacks to MEs.

Data Collection

A mailing list of 1,173 authorized participants in the National School Lunch and Breakfast Programs in Texas was obtained from the Texas Department of Agriculture. From this list, a random sample of 200 Texas school foodservice directors was drawn. The sample included nearly equal numbers of large, mid-size, and small school districts. Within the state of Texas, there are 117 large districts (7,501-207,147); 378 mid-size districts (1,000-7,500); and 678 small districts (999 and less). Thus the sample included a proportionately greater number of large districts in relation to small districts. Two mailings were completed. The first mailing included an original cover letter, questionnaire and self-addressed postage paid return envelope. Approximately three weeks later non-respondents were mailed a follow-up letter, a replacement copy of the survey and another postage paid return envelope as suggested by Brennan (2004) to shorten the response time. In order to increase participation, researchers followed recommendations of Bright and Smith (2002); respondents were offered the opportunities to enter a drawing for a $50 gift certificate at a local retail store and receive a summary of the results. To increase response rates, outgoing mail was mailed with a postage stamp as recommended by Clark and Kaminski (1990).

Data Analyses

Data were transferred from the surveys to data tables for analyses. All statistical tests were conducted using the computerized statistical package, SPSS version 12.0. Data relating to school district demographics, labor standards used, how labor is determined, and definitions for MEs were summarized with descriptive statistics including means, standard deviations, and frequency distributions. Analysis of variance (ANOVA) was used to determine if size of school enrollment or director education level was associated with use of specific labor standards. Multivariate analysis of variance (MANOVA) was used to compare perceived importance of 12 variables affecting labor productivity to various independent variables. Pearson's Product Moment correlations were used to test for significant relationships between the importance of variables affecting labor productivity. The significance value for these tests was $p < 0.05$.

RESULTS AND DISCUSSION

From 200 mailed surveys, 106 responses were received. One survey was discarded because of incomplete information; 105 surveys were analyzed, a 53% rate of return. Results showed a mean district enrollment of 11,292 and wide variation in district size with the smallest district reporting enrollment of 102 students and the largest reporting 85,000. According to payment status, the schools served an average of 48.02% free, 11.05% reduced and 40.35% paid meals. The majority of participants (100) indicated that their foodservice operations were self-operated by the school districts. Only five reported that their school foodservice operation was contract managed.

Labor Productivity Standards Used

Results indicate that the most commonly used labor standard in Texas school foodservice operations is MPLH. Three-fourths of the participants utilized this standard in their operation. This finding reinforces the results of Johnson and Chambers (2000) who found that MPLH was the most prevalent standard used for benchmarking in schools. The next most popular productivity standard was %LABOR with 28 school foodservice operations using this standard. Only 11 school foodservice directors chose to utilize SPLH as a productivity standard, and 17 reported that other standards were being used. These included sales/revenue per labor hour, plate cost, experience, or that the district establishes number of labor hours. However, six of the 17 noted that they did not use any standard at all or just continued with the same staff as last year. Two reported that they "hired what is needed" and did not use any other standards.

Statistical analyses showed that school districts that utilized the standards of MPLH ($p< 0.001$) and %LABOR ($p < 0.05$) had higher enrollment than those schools who did not use these standards (See Table 1). The 77 districts using MPLH as a standard for projecting labor needs had a mean enrollment of 14,277 while districts not using this standard had a mean enrollment of only 2,100. The 28 districts that reported using %LABOR had a mean enrollment of 17,054 while the 74 districts not utilizing this standard had an enrollment of 9,112. Enrollment size did not appear to be related to the use of SPLH or other labor productivity standards.

Table 1. District enrollment as associated with labor standards used by Texas school foodservice directors (N=102)

Enrollment					
	Response	n	Mean	+/-	SD
Meals per labor hour**	Yes	77	14,277	+/-	1,951
	No	25	2,100	+/-	5,657
Labor as a percentage of revenue/sales*	Yes	28	17,054	+/-	22,237
	No	74	9,112	+/-	12,390
Serving per labor hour	Yes	11	9,396	+/-	16,691
	No	91	11,522	+/-	15,989
Other methods	Yes	17	14,624	+/-	23,514
	No	85	10,626	+/-	14,128

* A significant difference was found at $p \leq 0.05$ (independent t-test)
** A significant difference was found at $p \leq 0.01$(independent t-test)

When asked how they determined the labor hours needed in a kitchen, 61 participants reported using MPLH standards, while 45 stated that past experience in foodservice was used to make this determination. Twenty-seven reported using the same staffing as the prior year with no change, while 21 reported using %LABOR to adjust or predict labor needs.

Definitions of Meal Equivalents

This study collected data on various methods used by school foodservice directors to convert school breakfasts, a la carte sales, and after school snacks to ME. The most common conversion used for breakfasts was "2 Breakfast = ME" with 43 respondents favoring this definition (See Table 2). Other frequent conversions were "1 Breakfast = ME" used by 20 respondents and "3 Breakfasts = ME" used by 17. About one-half of Texas school foodservice directors appeared to be following 2001 recommendations of the National Food Service Management Institute (NFSMI) (Cater, Cross, & Conklin, 2001) that two breakfasts equal one ME while about one-fifth were using three breakfasts per ME which concurs with

Pannell-Martin's (1999) recommendations. The most recent NFSMI recommendation that 3 breakfasts equal two MEs (Cater, Cross, & Conklin, 2005) was not being used by any schools in Texas.

Table 2. Meal Equivalent (ME) Definitions Used by Texas School Foodservice Directors (N=105)

		Frequency
Breakfast ME (n=83)		
1 ME =	1 Breakfast	20
	2 Breakfast	43
	3 Breakfast	17
	4 Breakfast	1
	Other	2
Ala carte ME (n=71)		
1 ME =	$1.00 of revenue	3
	$2.00 of revenue	23
	$3.00 of revenue	13
	Free lunch reimbursement rate	15
	Paid meal price	8
	Other	9
After-school snack ME (n=53)		
1 ME =	1 After-school snack	5
	2 After-school snack	2
	3 After-school snack	16
	4 After-school snack	17
	Not included in ME	9
	Other	4

A la carte meal equivalents were most commonly defined as "$2.00 of a la carte revenue = ME" by 23 respondents who converted a la carte items to meal equivalents. The next most frequently used methods of converting a la carte sales were the free lunch reimbursement rate used by 15 directors and $3.00 of revenue used by 13 directors. The $3.00 of revenue corresponds to Pannell-Martin's (1999) recommendations. Eight directors reported using the paying student lunch price to convert a la carte revenue to ME. Seven directors noted that they did not sell a la carte. Of nine respondents in the "Other" category, two used the adult price and one used the paid lunch price plus the reimbursement rate. Others noted an exact money figure used to make this conversion with figures ranging from a low of $1.25 to a high of $2.75. No one followed the NFSMI recommendation that the free lunch reimbursement rate plus commodity value be equal to a ME (Cater et al., 2001; Cater et al., 2005).

Only about one-half (n=53) respondents provided a definition for converting after school snacks to ME. Ten commented that they did not participate in the After School Snack Program while another 16 stated that this question was "not applicable". The majority of those who reported participating in the after school snack program defined ME as three snacks or four snacks. The NFSMI recommends that three after-school snacks equal one ME (Cater et al., 2001; Cater et al., 2005), and less than one-third of the directors were using this conversion. Several participants (n=9) noted that they did not consider snacks in the calculation of ME. However, two respondents utilized five snacks per ME and one used 10 snacks per ME.

Importance of Variables Affecting Labor Productivity

School foodservice directors considered volume of meals produced the most important variable affecting labor productivity (See Table 3). Differences in equipment available and on-site vs. central kitchen production were tied for second place while use of processed/convenience foods received the next highest rating. Length of menu cycle and varying items offered due to Offer vs. Serve, and varying number of serving lines were considered least important.

Table 3. Texas School Foodservice Directors Rating of Importance of Variables for Staffing a Foodservice Kitchen (N=105)

Importance Rating[a]				
Variables	**n**	**Mean**	**+/-**	**SD**
Volume of meals produced	105	4.6	+/-	0.7
Equipment available	105	4.3	+/-	0.9
On-site vs central kitchen production	101	4.3	+/-	1.1
Use of processed/convenience foods	105	4.0	+/-	0.9
Experience of workers	105	3.9	+/-	1.1
Number of menu choices offered	105	3.9	+/-	1.1
Length of serving periods	105	3.8	+/-	1.2
Including supervisory labor	105	3.8	+/-	1.2
Use of disposables	104	3.8	+/-	1.1
Varying number of serving lines	102	3.5	+/-	1.4
Varying items due to Offer vs. Serve	105	3.4	+/-	1.3
Length of menu cycle	104	3.0	+/-	1.3

[a] The rating scale used was 1 to 5 with "1" = Not Important and "5" = Very Important.

Analyses of correlations between variables that affect labor productivity and enrollment showed several moderate correlations (Table 4). As enrollment increased, there was a moderate negative correlation with the importance foodservice directors placed on variances due to Offer vs. Serve. There was also a positive correlation between increased enrollment and the number of serving lines. Thus, directors of larger school districts appeared to place greater importance on the number of serving lines needed to determine their labor and less importance on variations due to Offer vs. Serve.

Table 4. Correlations between Variables Affecting Labor Productivity in School Foodservice Operations (N=105)*

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Variables	Enrollment	Variance due to OS[a]	Variance in serving lines	Length of serving periods	On-site vs central kitchen	Differences in equipment	Volume of meals	Length of menu cycle	Number of menu choices	Processed vs convenience foods	Use of disposables	Experience of workforce
Variance due to OS[a]	- .329**											
Variance in serving lines	.339**	-.048										
Length of serving periods	-.012	.323**	.146									
On-site vs. central kitchen	.045	.202*	.090	.124								
Differences in equipment	-.117	.331**	.189	.376**	.383**							
Volume of meals	.079	.232*	.247*	.367**	.492**	.445**						
Length of menu cycle	-.234*	.483**	-.138	.377**	.188	.375**	.296**					
Number of menu choices	-.154	.412**	.120	.343**	.193	.328**	.445**	.564**				
Processed vs convenience foods	.065	.151	.290**	.126	.134	.119	.219*	.073	.200*			
Use of disposables	.169	.095	.303**	.214*	.222**	.175	.335**	-.021	.179	.508**		
Experience of workforce	-.084	.465**	.051	.279**	.155	.292**	.317**	.362**	.495**	.192*	.228*	
Supervisory labor	-.191	.240*	.089	.272**	.088	.214*	.158	.216*	.152	.226*	.235*	.164

[a] OS = Offer vs. Serve
* A significant correlation was found at $p \leq 0.05$
** A significant correlation was found at $p \leq 0.01$

**Note: Please click the image to enlarge Table 4*

Additional moderate correlations were found between school foodservice director perceptions of the 12 variables. There was a moderate correlation between importance attached to variance due to Offer vs. Serve and five other variables (length of menu cycle, experience of workforce, number of menu choices, length of serving periods, and differences in equipment). Directors who valued the importance of varying number of serving lines also found use of disposables and use of processed/convenience foods of value in affecting labor. Length of serving periods was moderately correlated with length of menu cycle, differences in equipment, volume of meals served, and the number of menu choices. Moderate correlations were also found between on-site vs. central kitchen production and volume of meals and differences in equipment. Directors who valued differences in equipment also valued volume of meals, length of menu cycle, and number of choices offered. Moderate correlations were present between volume of meals produced and the number of choices offered, use of disposables and experience of the workers. Length of menu cycle was correlated to the number of choices offered and experience of workers. Additional moderate correlations were found between the number of choices offered and the experience of the workers and between the use of processed/convenience foods and the use of disposables.

CONCLUSIONS AND APPLICATIONS

This study shows that MPLH is the most common labor productivity standard used by school foodservice directors in Texas with a smaller number of directors using %Labor or SPLH. These standards can be used by school foodservice directors for both internal and external benchmarking purposes. Directors who use MPLH or other standards internally to compare labor productivity at each school within the district should make sure that all food production is accurately counted and uniform methods used to convert breakfasts, snacks, and a la carte sales to MEs. All food production such as lunches for field trips, food for teacher and staff meetings, and other catered events should be included. These can be converted to MEs by the same method used to convert a la carte sales to MEs. When accurate records are kept, labor productivity standards can be calculated for each school and used to adjust staffing equitably within the school district according to forecasted school enrollments. Slightly over one-half of school foodservice directors in this study used MPLH as a guide for determining labor hours needed in their kitchens, and about one-fifth used %Labor.

Foodservice directors may also use MPLH as a benchmark to compare their labor productivity standards to that of other schools. However, results of this study showed that directors used a variety of definitions for a ME, and this is likely to impede accurate external benchmarking among districts. In order for external benchmarking to be effective, a common definition of MEs is necessary. When different methods are used to convert breakfasts, snacks, and a la carte meals to MEs, comparisons will not be accurate. For example, if one school district defines one breakfast as a ME, while another defines four breakfasts as a ME, they will arrive at quite different MPLH. Likewise, a school might calculate $1.00 of a la carte revenue as equal to 1 ME, while another might convert a la carte sales according to the paid meal price. Although the NFSMI has made recommendations on methods of converting breakfasts, snacks, and a la carte revenue to MEs (Cater et al., 2001; Cater et al., 2005), few schools appear to follow these recommendations.

Because of all the variations in calculating MEs, one might conclude that use of SPLH proposed by Mayo and Olsen (1987) would be a more appropriate labor productivity standard, as it would eliminate the need to calculate MEs. Currently SPLH is not a widely used labor productivity standard in Texas, as only 11 of 102 directors reported its use. Data collection for this method is more cumbersome than counting the number of meals and calculating meal equivalents. The National School Lunch Program requires that daily meal count be summarized and collected centrally in a district in order to file reimbursement claims. However, records showing the amounts of food served are only required to be maintained at the school sites. Use of the SPLH standard would require the data on amounts of food served to be compiled at the central office, and this additional data collection could be a hindrance to the use of the SPLH standard.

Use of the SPLH standard, however, would eliminate variances due to meal patterns and Offer vs. Serve. Through additional study, one could identify benchmark standards for ranges of serving volume and vary the standards depending on whether operations used scratch foods, processed/convenience foods and/or disposable dinnerware. The challenge remaining would be to adjust the standards according to equipment available, worker experience, number of menu choices, and number of serving lines. It would also be important to determine and provide direction on whether labor hours provided by management employees should be included. With further work, it could be possible to develop a SPLH standard that accounts for a majority of variables so that external benchmarking could provide accurate comparisons.

In this study, volume of meals produced, available equipment, and on-site vs. central kitchen production were considered the most important variables to consider when staffing a school foodservice kitchen. However, relationships between variables are sometimes complex. An example of how variables may be inter-related can be illustrated by the practice of serving breakfast in the classroom, which has become a trend in the last few years. This process might typically involve the use of processed/convenience foods and disposable packaging rather than menu items made from scratch. Many schools prepare meals from pre-made individually wrapped items to reduce labor in preparation and compensate for the labor needed to pack and deliver breakfast items to the classrooms. The volume increase that occurs when all students receive breakfast meals in the classroom can cause an on-site operation to resemble a central kitchen as staff prepare menu items for classroom delivery. In this situation, it is obvious that volume of meals produced, on-site vs central kitchen production, use of processed/convenience foods, number of menu choices, and use of disposables will all affect productivity. These variables do affect labor requirements, and foodservice directors should consider them as much as possible when making future plans.

Limitations of this study included the small sample size and large range in school district enrollment. There were 105 participants in this study; however, there are over 1,100 school districts in Texas enrolled in the National School Lunch Program or School Breakfast Program, so this study reflects practices of only about one-tenth of school foodservice directors in the state of Texas. Also, school district enrollment of participants ranged from 102 to 85,000. Thus there was also undoubtedly great variation in volume of meals, equipment available, number of menu choices, length of serving periods, number of serving lines, and other variables that affected labor productivity at these schools.

Based on study results, the following recommendations are made:

1. School foodservice directors should take into consideration production and menu variables at their schools when determining the most appropriate methods of calculating MEs.
2. School foodservice directors should make sure that all food produced by school foodservice staff is counted as meals or MEs.
3. State agencies that oversee school programs should provide training on labor productivity standards and NFSMI recommended methods of calculating MEs to child nutrition professionals at regional, state, and national meetings or as webinars.
4. Further research should be conducted on reasons that school foodservice directors use various definitions of MEs and the possible use of SPLH as a more reliable and accurate labor productivity standard.

In conclusion, there seems to be little consistency in labor productivity standards and definitions of MEs used by Texas school foodservice directors, and this limits the validity of external benchmarking among districts. However, directors can still use labor productivity standards such as MPLH for internal benchmarking within a school district. This will allow comparison of productivity between schools with similar menus, serving sizes, and enrollment and will enable directors to investigate and make improvements when individual schools deviate far below mean labor productivity standards. Internal benchmarking can also be used to project labor needs and make decisions about staffing. When benchmarking with others, school foodservice directors should remember that it is critical to take into consideration variances in the definitions for MEs.

REFERENCES

Brennan, M. (2004). A test of two procedures for increasing responses to mail surveys. *Marketing Bulletin, 15*, Research Note 3.

Bright, K.D., & Smith, P.M. (2002). The use of incentives to affect response rates for a mail survey of U.S. marina decision makers. *Forest Products Journal, 52*, 26-29.

Campbell, C.A. (1985). The enhanced productivity program. *Journal of the American Dietetic Association, 85*, 1479-1482.

Cater, J., Cross, E., & Conklin, M. (2001). *Financial management information system technical report.* National Food Service Management Institute: Hattiesburg, MS.

Cater, J., Cross, E., & Conklin, M. (2005). *National Food Service Management Institute financial management information system*. Retrieved October 5, 2008 from http://www.nfsmi.org/documentLibraryFiles/PDF/20080225030902.pdf

Clark, G.L. & Kaminski, P.F. (1990). How to get more for your money in mail surveys. *The Journal of Services Marketing, 4*, 41-47.

Cluskey, M., & Messersmith, A.M. (1991). Status of training programs and perceived labor problems in four types of noncommercial foodservice operations. *Journal of the American Dietetic Association, 91*, 1239-1242.

Gregoire, M.B., & Spears, M.C. (2007). *Foodservice organizations: A managerial and systems approach* (6th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Johnson, B.C., & Chambers, M.J. (2000). Foodservice benchmarking: Practices, attitudes, and beliefs of foodservice directors. *Journal of the American Dietetic Association, 100*, 175-180.

Kavulla, T.A. (1996). Keeping a lid on labor costs. *School Foodservice & Nutrition*, *50*, pp. 28, 30, 32.

Knickrehm, M.E., McConnell, R.J., & Berg, C.A. (1981). Labor time analysis: School lunch meal pattern versus a la carte meal service in a public school system. *School Food Service Research Review, 5*, 85-89.

Pannell-Martin, D., & Applebaum, G.B. (1999). Financial management. In Martin, J., & Conklin, M.T. (Eds.), *Managing child nutrition programs: Leadership for excellence*. Gaithersburg, MD: Aspen Publication.

Martin, J., & Oakley, C.B. (2008). *Managing child nutrition programs: Leadership for excellence*. (2nd Ed.). Sudberry, MA: Jones and Bartlett Publishers.

Mayo, C.R., & Olsen, M.D. (1987). Food servings per labor hour: An alternative productivity measure. *School Food Service Research Review*, *11*, 48-51.

Pannell-Martin, D. (1990). *School foodservice management*. New York: Van Nostrand Reinhold.

Pannell-Martin, D. (1999). *School food service management for the 21st century* (5th ed.). Alexandria, VA: inTEAM Associates, Inc.

Payne-Palacio, J. & Theis, M. (2005). *Introduction to food service* (10th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Schechter, M. (1997). The great productivity quest. *Food Management*, *1*, pp. 46, 48, 52, 54.

Waldvogel, C.F., & Ostenso, G.L. (1977). Labor time per portion and volume in foodservice. *Journal of the American Dietetic Association*, *70*, 178-180.

Yung, L.S., Matthews, M.E., Johnson, V.K., & Johnson, N.E. (1981). Variables affecting productivity in food service systems of nursing homes. *Journal of the American Dietetic Association*, *78*, 342-348.

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