

## SUGGESTIONS FOR IMPLEMENTING TRAYFREE DINING IN A SELECTED DINING UNIT

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### ABSTRACT

Trayfree dining has become a popular method of improving the sustainability of university dining facilities. Telephone interviews were conducted with foodservice professionals to identify benefits, challenges, best practices, and recommendations. Student focus groups evaluated the operational feasibility of implementing trayfree dining at a Midwestern university. Recommendations for successful implementation of trayfree dining are presented.

**Keywords:** trayfree dining, university foodservice, sustainability, management

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### INTRODUCTION

Sustainability and going green have become popular trends among individuals and organizations globally. Despite this motivation towards sustainable actions, our nation continues to struggle with the amount of waste generated and the most efficient waste management strategies. In 2010, the United States (U.S.) generated 250 million tons of municipal solid waste, 13.9% of which was estimated to be food scraps (Environmental Protection Agency [EPA], 2011). University dining operations struggle with the management of the considerable waste they generate. Saphire (1995) reported that university dining operations generate nearly 3.6 million tons of waste per year; 10-20% is estimated to be food. Other studies also have demonstrated the large amounts of food waste being disposed of by students in on-campus facilities (Norton & Martin, 1991; Shanklin and Ferris, 1992; Whitehair, Shanklin, & Brannon, 2013; Van Handel, 2004). Shanklin and Ferris (1992) determined that more than 83 tons of edible food items were being disposed of annually on student trays in a single facility. Others have reported that students discarded an average of more than two ounces per meal of edible food waste (Norton & Martin, 1991; Van Handel, 2004; Whitehair, Shanklin, & Brannon, 2013). This amount of food represents thousands of dollars in food products and tons of solid waste.

Foodservice waste involves products, time, energy, water, and other resources (American Dietetic Association, 2001; Wie, Shanklin, & Lee, 2003). Foodservice operations often manage this waste by utilizing garbage disposals and transporting waste to landfills (Ferris, Flores, Shanklin, & Whitworth, 1995). While convenient, these methods of waste management contribute their own problems to the cycle of sustainability.

Colleges and universities are initiating more sustainable practices due to their increased concern about the environment (Sustainable Endowments Institute, 2010). Recycling, composting, bioconversion,

and animal feed are options suitable for foodservice waste (Ferris et al., 1995; Shanklin & Ferris, 1992; Wie, Shanklin, & Lee, 2003). Some universities have implemented methods to repurpose various waste products rather than dispose of it. Colorado State has implemented the use of residence hall graywater (water from sinks and showers) for surface irrigation (Colorado State Department of Public Relations, 2011). George Washington University initiated their "Green Office Program" to encourage their offices and departments to reduce printer and copier paper use, and increase recycling (International Perspectives on Green Business, 2011). A student-run farm is fertilized by compost produced by utilizing campus food waste at Kansas State University (Baer, Blattner, Boss, Ostmeyer, & Wiens, 2009).

Programs, such as these, are initiated in an effort to educate university students and employees while improving the sustainability of the campus environment. While evaluating methods of managing waste is a step in the right direction, evaluating the entire cycle of the food production process and implementing strategies to prevent food waste initially may be a better approach (Kantor, Lipton, Manchester, & Oiveira, 1997).

One method of waste reduction is the removal of dining trays. Many campus dining facilities are implementing a trayfree style of service. Simply removing the option of using a dining hall tray has been found to decrease the amount of food waste and reduce the water and chemicals used in dishmachines (Aramark, 2008; Davis, 2008; Karstens & Moe, 2009; Saavedra, 2008). Aramark (2008) observed a 25% reduction in per-person food waste when trays were removed. Sodexo estimated saving nearly 200 gallons of water daily for every 1,000 meals served (Sodexo, 2008). A reduction of more than 11 tons of food waste and \$14,000 in food cost resulted from the removal of dining hall trays at San Diego State (Saavedra, 2008). Thiagarajah and Getty (2013) observed an 18.4% reduction in solid food waste per university patron when trays were removed in a buffet-style operation. They also reported the dining staff was in support of the change. Trayfree dining has allowed these facilities to reduce their environmental footprint and save money.

### Statement of the Problem

While foodservice operators may strive to implement changes that direct them towards a more sustainable facility, the options may seem daunting. Trayfree dining has been implemented in many facilities and has been shown to decrease the amount of edible food disposed of while also reducing water, energy, and chemical use (Aramark, 2008; Karstens & Moe, 2009; Saavedra, 2008; Sodexo, 2008). However, foodservice managers may still be skeptical about implementing a service style change due to concern about customer satisfaction and reduced profitability. Having access to guidance and suggestions to evaluate the operational feasibility of implementing trayfree dining would be valuable information for managers considering the implementation of such a system.

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Currently little information is available in regards to customer acceptance and facility, equipment, and service needs for the removal of dining hall trays. Past research has focused on the environmental and economic benefits of trayfree service based on pre and post tray removal comparisons (Aramark, 2008; Karstens & Moe, 2009; Saavedra, 2008). Limited research was found that explored foodservice managers' experiences in implementing trayfree dining. Results of research of this nature could be useful when identifying best practices for the successful implementation of trayfree service.

### Purpose of Study

The primary purpose of the study was to conduct a best practices review with managers of university dining facilities involved in the management of a trayfree style of service. The operational research used telephone interviews with foodservice professionals to obtain data about their experiences implementing trayfree dining. The second purpose was to explore the feasibility of implementing a trayfree dining program in a Midwestern university dining facility. This dining unit was an "all-you-care-to-eat" cafeteria style facility catering to approximately 540 students residing in three primary residence halls. Breakfast, lunch, and dinner were served Monday through Friday with an average daily service of 1,027 meals. Focus groups with students were conducted to investigate perceptions of tray removal in this facility. Based on the interviews and focus groups, recommendations for evaluating the operational feasibility and the successful implementation of such a program were identified and are presented.

### METHODOLOGY

The scope of this research was two-fold in that input from both university foodservice professionals and dining center student patrons was desired. The study protocol, best practices review interview outline, and focus group questions were approved by the university's Institutional Review Board prior to any contact with participants.

#### Best Practices Review

**Recruitment Method and Participants:** The population for this study was university foodservice professionals who were members of The National Association of College and University Foodservice (NACUFS) and regional universities identified as having trayfree dining facilities. The 2010 NACUFS publication of "Trayless Members in NACUFS" was used to identify 70 foodservice professionals involved in trayfree dining (NACUFS, 2010). In addition, thirteen regional universities were identified as being trayfree by website research and personal contact. These 83 professionals from across the United States were contacted via e-mail, provided details of the study, and asked to participate. Follow-up e-mails were sent to non-responding professionals one week after initial contact. Dates and times for phone interviews were scheduled via e-mail. Twenty-four of the NACUFS professionals contacted agreed to participate in the telephone interviews and thus composed the final convenience sample. No regional organizations responded with their willingness to participate.

**Development of Instrument:** Seven open-ended interview questions were developed after reviewing trade and peer reviewed publications about the trayfree dining system and determining the specific input desired to assist this dining unit in evaluating the feasibility of implementing trayfree dining (Figure 1). The interviews were used to explore university foodservice professionals' perceptions on the implementation of trayfree dining in their facilities. The open-ended interview questions asked managers to provide input on the challenges, benefits, and recommendations related to implementing

or evaluating the feasibility of a trayfree system. They were also asked to provide general information about their facilities and the timeline for trayfree implementation. During the interviews, the directors were prompted to elaborate on their responses.

#### Data Collection:

The 24 managers willing to participate were contacted via e-mail to schedule a time for the telephone interview. The researcher followed a written script to facilitate progress and to ensure that information was gathered uniformly during the scheduled phone interview (Figure 1). Participants were informed that the conversations would be audio-recorded. All interviews were confidential and participants had the opportunity to refuse to answer questions or withdraw at any time.

#### Student Focus Groups

**Recruitment Method and Participants:** Promotional materials inviting students to participate in a focus group discussing trayfree dining were posted on various bulletin boards and throughout the dining center. Individuals who consumed at least one meal a day in this facility, lived in a residence hall within the complex, and were at least 18 years of age were asked to sign-up to participate in the focus group. Three focus groups of residence hall students were scheduled to be conducted in March of 2011, however, only two sessions were conducted due to insufficient response to the invitation. A total of eleven students signed-up to participate.

**Focus Group Discussion:** Each of the focus group discussions was held after dinner in the dining hall. The purpose of the focus group was to determine student familiarity with trayfree dining, identify perceived barriers and potential benefits, and document recommendations they may have for the future of this dining unit. The researchers developed and followed a focus group guide which contained disclosure, guideline information, and questions to facilitate the discussion. Permission was granted to audio record the discussions to aid in documentation.

During the focus group the students completed a survey which allowed for quantitative analysis of the students' support for and concern with the implementation of trayfree dining and the changes that the students perceived would be needed. Students were asked to rate their agreement with five statements ranging from Strongly Disagree (1) to Strongly Agree (5). The students were asked to dine the following week without using a tray, and then follow up with the researcher on an individual basis to revisit the discussion and complete a post-trayfree experience survey. This process allowed for further analysis of student perceptions of trayfree dining after their exposure to the trayfree service style.

#### DATA ANALYSIS

Interview data was compiled and sorted by category: problems, benefits, best practices, and recommendations. NVivo software (version 9, 2010, QSR International, Australia) was used to organize themes for the qualitative data. Frequency and descriptive statistics were determined using SPSS (version 13.0, 2004, SPSS, Inc., Chicago: IL).

#### Results and Discussion

**Interviews:** All managers were asked general questions about their operations. The managers indicated the number of years their trayfree-style of service had been in operation ranged from one to four years. The number of meals served daily by these facilities ranged from 500 on a campus with a single trayfree facility to over 20,000 at a university with five on-campus dining facilities. Twenty-three operations were self-operated; only one was managed by a contract foodservice company. A majority of the operations were all-

### Telephone Interview Guide

Contact Name: \_\_\_\_\_ Desired Time of Contact: \_\_\_\_\_  
 University: \_\_\_\_\_ Actual Contact: \_\_\_\_\_

Hello. This is <<Interviewer's Name>> from Midwest University. May I please speak to <<Primary contact's name>>.

- Hi, I am calling from the Hospitality Management and Dietetics Program at Midwest University.
- We are conducting a study to identify best practices in implementing a trayfree dining program. We are contacting all <<NACUFS members or regional universities>> who have implemented trayfree dining. You received an e-mail about this within the last week.
- Do you have 15 minutes now to respond to a few questions?
  - If yes – Do you mind if I record this conversation for clarity? All of your responses will remain anonymous.
    - If yes – ask questions #1-#7.
  - If no – when can I call you back later today? (Schedule a specific time and note the details.)
- Thank you for your time and participation.

Date	Time	Interviewer	Results						
			No Answer	Unavailable	Will Return (Note name and time to contact)	Refused (Note when and why)	Call Completed	Partially Completed (Note when call ended and why)	Wrong Number
Notes:									

Phone Interview Questions (Allow for continued discussion or additional topics):

1. When did you implement your trayfree dining program?
2. How many meals do you serve in this facility?
3. What changes to your facility did you have to make prior to the implementation?
4. What complications or problems have you encountered along the way? How did you resolve the problems or address the complications?
5. What benefits have you seen from the implementation of trayfree system?
6. What recommendations or advice do you have for university dining centers who are exploring trayfree dining?
7. What one best practice would you advise others to follow when investigating the feasibility of trayfree dining?

**Figure 1. Telephone Interview Guide**

you-care-to-eat operations with both self-serve and employee-served options. Five were all-you-care-to-eat facilities comprised of entirely self-serve food delivery stations.

The managers were asked to identify any changes that were made to their facility to accommodate the trayfree style of service. Two managers indicated no changes were made to their facilities to accommodate the new format. Fifteen managers described physical dishroom changes that had to be made to facilitate the trayfree operation. These physical changes were simple modifications, such as adding trays or solid surface material to their carousel/accumulator style dish return areas (n=12) and reformatting belt returns to have sides to prevent spillage (n=2). No managers indicated that remodeling or equipment changes were necessary for their dishroom and sanitation areas to accommodate the trayfree operation.

Thirteen managers discussed the need to relocate silverware stations in their facilities. Silverware was made available throughout their service areas rather than at a single entry-area dispenser. Locations included serving lines, self-serve stations, beverage areas, and dining rooms. Similarly, three operations relocated their service ware (plates, bowls) to the serving line and self-serve areas. Overall, no major renovations or capital purchases were required in any of these facilities to implement trayfree dining.

**Themes Identified in Interviews:** The telephone discussion allowed specific topics to be covered but the open-ended format allowed managers to speak freely and provide personal experiences and opinions. Figure 2 demonstrates the primary topics of discussion. Specific response patterns became evident.

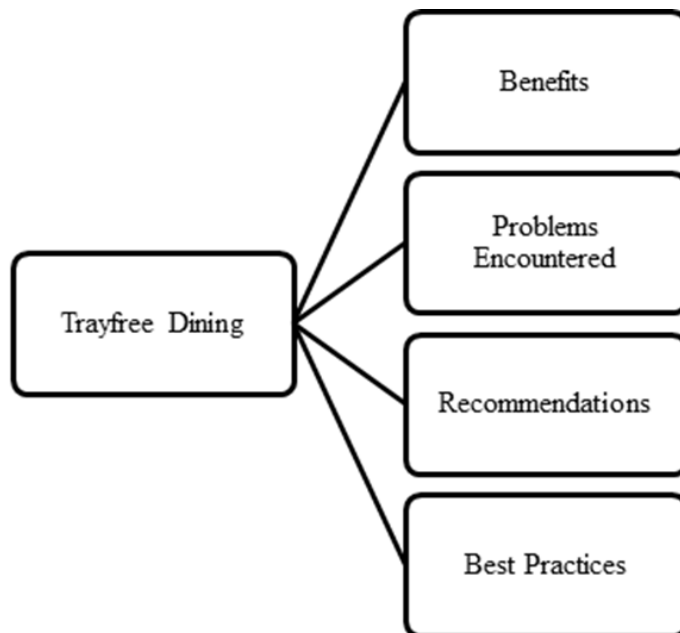
**Benefits:** Decreased food waste was identified as the primary benefit of tray removal by twenty managers (Table 1). Two facilities reported a 30% reduction in food waste, one reported a 40% reduction, and another reported a 50% reduction. Benefits of reduced waste included less “chaos” in the dishroom, lower labor requirements for sanitation, and lower waste removal costs.

Decreased utility use was noted by sixteen managers. The utilities discussed included water and energy and supported findings of

**Table 1. Benefits of Trayfree Dining Identified by Foodservice Managers (n=24)**

Benefits	n	% <sup>a</sup>
Decreased Food Waste	20	83.33
Decreased Water Use	13	54.17
Decreased Chemical Use	10	41.67
Decreased Food Cost	10	41.67
Improved Dishroom Efficiency	9	37.50
Improved Service and Satisfaction	7	29.17
Good Public Relations	6	25.00
Student Health Benefits	5	20.83
Decreased Energy Use	4	16.67
Decreased Beverage Cost	4	16.67
Less Napkin Use	2	8.33
Student Lifestyle Changes	1	4.17

<sup>a</sup>Percentage of all respondents who identified this specific benefit.



**Figure 2. Trayfree Phone Discussion Theme Diagram**

previous studies (Aramark, 2008; Sodexo, 2008). Fourteen facilities reported a reduction in water use. The water savings reported ranged from 20% to 50%. One facility reported washing 220,000 fewer trays per year. Another saved approximately one million gallons of water in the first year of tray removal. Energy savings was identified by four managers as a benefit. Many managers mentioned the difficulty in reducing energy use in their dishroom areas because the machines are often left to idle between loads. This practice reduces water usage, but energy is still required for maintenance of the machine temperatures.

Other savings identified as benefits of tray removal included reduced chemical use, decreased beverage and food costs, and reduced food production needs. Reduction in chemical use in the dishroom area was identified as a benefit by 10 managers. Ten managers reported a food and beverage cost reduction, similar to reports by Saavedra (2008). Two managers identified the need to prepare less food as the primary reason for this reduction in cost. One manager reported a 30% savings in beverage expenses, while another observed a 23% reduction in milk purchases alone.

Six managers identified positive public relations as a benefit of the tray removal. Their trayfree programs had received coverage by campus groups and newspapers based on their positive sustainable action. Five managers reported an unexpected increase in customer satisfaction directly related to their trayfree program. One manager described positive student perceptions of the improved sustainability of the facility, while four indicated shorter lines and customer waits improved student perceptions. These shorter lines were explained to be a result of less “wondering around” and “grazing” by the students. Managers reported that students made more focused choices rather than taking a little of something from each serving area. Decreased wandering by students was considered by five managers to provide a health benefit to their student population. These managers reported that the lack of trays forced students to make better choices by preventing tray loading. Managers also identified improved portion control and decreased calorie consumptions as positive outcomes of their trayfree program.

**Table 2. Problems of Trayfree Dining Identified by Foodservice Managers (n=24)**

Problems	n	% <sup>a</sup>
Complaints	17	70.83
Messing Dining Room Tables	16	66.67
Dishroom Problems	5	20.83
Increased Dish Breakage	4	16.67
More Spills	4	16.67
Did Not Monitor Data of Change	3	12.50
Student Issues with Change	3	12.50
Dirtier Floors	2	8.33

<sup>a</sup>Percentage of all respondents who identified this specific problem.

### Problems Encountered

Table 2 illustrates the problems identified by the foodservice managers. Seventeen managers indicated that their facilities received complaints regarding the removal of trays. Complaint topics included needing to make multiple trips between the serving and dining areas, having difficulty carrying personal items and food without trays, and the spillage of more beverages. However, all of these managers stated that the complaints were minimal and subsided within the first two weeks after the removal of trays. Three of the managers indicated that most complaints were received from faculty and staff, and not students dining in their facilities.

Sixteen managers stated that dining room cleanliness became a problem. Tables were messier due to crumbs and spills. These managers indicated that adding an employee to clean tables throughout the meal period was a necessity. When asked if additional labor was needed for this, five of these managers indicated that dishroom labor was reallocated from pulling trays in the dishroom to wiping tables in the dining areas. Two facilities organized a self-serve sanitation area in which students could retrieve the materials needed to clean their own spills; both indicated positive student participation.

### RECOMMENDATIONS

When asked for recommendations for a successful transition to trayfree dining, nineteen managers indicated some form of marketing

**Table 3. Recommendations for Trayfree Dining Identified by Foodservice Managers (n=24)**

Recommendations	n	% <sup>a</sup>
Involve Students	16	66.67
Market and Educate	15	62.50
Conduct Waste Analysis	10	41.67
Communicate	9	37.50
Remove All Trays at One Time	5	20.83
Implement at Beginning of Fall Semester	5	20.83
Evaluate the Change	4	16.67
Ease into the Change	2	8.33
Consider Individuals with Disabilities	1	4.17
Involve Upper Administration	1	4.17
Purchase Larger Plates	1	4.17
Plan Ahead	1	4.17
Stand Your Ground	1	4.17

<sup>a</sup>Percentage of all respondents who identified this specific recommendation.

communication prior to and during the transition process was necessary (Table 3). Sixteen managers stressed the importance of involving students in the transition. Focus groups, student interest group interaction, and peer groups to introduce the new process were all methods shared. Fifteen managers indicated the importance of using a marketing campaign to educate students on the reasons behind the change and the benefits of a trayfree facility. Ten managers encouraged using waste audits for gathering data to reinforce the educational efforts. These recommendations mirrored those provided by Aramark (2008).

Five managers suggested implementing the new trayfree program at the beginning of the fall semester. The managers stressed that preventing incoming students from being exposed to a dining hall tray would benefit the operation greatly. Five managers indicated that removing the trays entirely from the facility was the best method of implementation. These managers recommended avoiding occasional trayfree events and days of service. They felt it was confusing to the students and often allowed more comparison between the methods of service. Other recommendations from these managers included involving upper administration, planning ahead, and being consistent in implementing the plan when students, faculty, or staff complained.

### Best Practices

The telephone discussions with these managers identified best practices for implementation of trayfree dining (Table 4). Two overall best practices were identified by a majority of the managers interviewed.

Ten managers stressed the importance of having data to quantify the impact of the tray removal. Waste and expense audits were used to provide quality information to evaluate the success of such a change. Using the waste itself and the data collected as demonstrations of the change were identified as successful methods of student education and increased awareness.

Communication, marketing, and student involvement were identified by twelve of the managers as the best practice when implementing a service-style change such as tray removal. Managers discussed the positive outcome of allowing students to feel involved and to have input on the change. Postings, face-to-face interactions, and events were all methods used to engage students in the topic of trayfree dining. One facility encouraged having a manager available during

**Table 4. Best Practices for Trayfree Dining Identified by Foodservice Managers (n=24)**

Best Practices	n	% <sup>a</sup>
Quantify the Change	7	29.17
Market and Educate	5	20.83
Involve Students	4	16.67
Communicate	3	12.50
Demonstrate the Waste	3	12.50
Focus on Environment Not Savings	3	12.50
Start At the Beginning of the Semester	3	12.50
Involve Upper Administration	2	8.33
Stand Your Ground	2	8.33
Using the Savings on Students	2	8.33
Conduct Waste Trials	2	8.33
Ease Into the Change	1	4.17

<sup>a</sup>Percentage of all respondents who identified this specific practice.

meal service to answer questions about the trayfree program and gain insight into students' perceptions of the change.

### Focus Groups

Eleven students participated in focus group discussions regarding trayfree dining at the facility. The students reported having very little exposure to dining facilities without the option of trays. The primary type of trayfree dining exposure was restaurant buffets.

When asked to identify obstacles to trayfree dining, many students discussed the congestion in serving areas. They felt that spills and dish breakage would happen more often due to the crowds and lack of space to move around. However, their concerns focused on others around them and not their own ability to handle a trayfree experience. Only one suggestion was made about increasing the size of beverage glasses, however, a student suggestion regarding the use of divided tray-type plates became quite heated. Many students felt a divided tray would allow for multiple food options without items having to touch and overlap on their plates. This would decrease tray washing while still allowing the students flexibility on their choices. When probed as to why this idea of a divided tray had so much support, it was obvious that freedom of choice and the ability to separate food items was important to the group.

Students were asked to discuss changes they perceived as necessary for trayfree dining to work in this dining center. Many students indicated it would be important to move silverware throughout the facility. One student suggested placing silverware on dining tables, while others indicated having it available near serving lines and in dining rooms would be sufficient. The carousel-type dish return was discussed to be appropriate for such a change although solid surfaces were suggested to prevent items from falling through. Some students thought others may stack items high and cause spills in this area. One student suggested having students sort their own trash and silverware at the dish return area. However, a majority of the students enjoyed the current relaxed, carefree atmosphere and indicated that having students sort their waste would take away from the current atmosphere. These comments suggested that avoiding unnecessary changes in students' routine is important when implementing trayfree dining.

The timing and manner in which trayfree dining should be implemented was discussed. Few students indicated that easing into a change such as this would be successful. They indicated that if a trayfree day was implemented that students who were against the change would simply eat elsewhere on those days. A majority indicated that removing trays at the beginning of a semester when many students would be new to the facility would be the best option. The students agreed with the foodservice managers that it would be best not to present the tray option to new students to avoid the comparison of systems. At this point, it was also recommended to advertise the removal of the trays the prior semester. Students noted that advance notification to returning students would give them the opportunity to move elsewhere if they did not support the change and believed they could not adapt. Overall, the focus group participants stated that students may be upset at first but would learn to adapt.

The focus groups indicated the students had little concern about the removal of trays in this dining facility. However, the survey administered during the initial focus groups indicated only slightly higher than neutral (3.00) level of support in implementing trayfree dining ( $M = 3.18$ ,  $SD = 0.60$ ). The survey completed after the students

voluntarily dined trayfree showed an improvement in acceptance indicating they more than agreed (4.00) that they would support the implementation of trayfree dining ( $M = 4.29$ ,  $SD = 0.76$ ). Students' rated their level of agreement that trayfree dining can facilitate decreasing food waste higher than neutral (3.00) both prior to ( $M = 4.27$ ,  $SD = 0.66$ ) and following their trial experience with trayfree dining ( $M = 4.71$ ,  $SD = 0.49$ ).

The level of agreement with suggested service ware changes increased from the pre to post-experience survey. Following their trial experience with trayfree dining the students more than agreed (4.00) that larger glasses ( $M = 4.79$ ,  $SD = 0.39$ ), larger plates and/or bowls ( $M = 4.00$ ,  $SD = 1.00$ ), and relocating silverware to the dining room ( $M = 4.29$ ,  $SD = 0.95$ ) would assist in making trayfree successful at this facility.

Overall, the focus group participants showed positive support for the implementation of trayfree dining. Their recommendations for minor changes were the same as the best practices identified by the foodservice managers.

### Suggestions and Rationale for Implementing Trayfree Dining

All 24 managers reported immediate benefits from the removal of dining hall trays. No managers indicated the need for major purchases or renovations for the success of their trayfree program. Furthermore, multiple facilities reported an increase in student satisfaction. Student focus group participants also indicated their support while providing suggestions for only minor changes to the operation for success. Given the overall positive outcomes from the discussions with these individuals and the ease of transition other foodservice facilities have experienced, implementation of trayfree dining is recommended.

The removal of dining trays from the facility would likely stimulate a decrease in the amount of edible food items being disposed of. Many of the managers interviewed indicated that students make more informed choices and take less food from the serving areas when they do not have a tray to place extra menu items. The decrease in the amount of food each student takes, and therefore consumes, has many benefits. Several managers stated that the amount of food items prepared in their facilities decreased. Therefore, it is likely that food costs would decrease in response to the need for less production. These savings would benefit the operation financially as less food would need to be purchased and less food waste processed.

A second benefit of the decrease in food taken is the potential health improvements gained by the students. Improved awareness of serving sizes and more informed food choices were indicated by multiple managers as positive outcomes of trayfree dining. Since students have limited space on the plates, they must select items that fit, thus they may review the menu board in advance and determine food choices. Rather than taking larger servings of their favorite items, they may choose to take smaller amounts as to allow more items to fit on the plate they will be carrying. Overall, these eating behavior changes will influence their lifestyle and may improve their current and future health status.

Fifteen managers indicated the need to educate students on the transition and student focus groups reinforced this recommendation. While the financial benefits may seem appealing to the facility, the educational marketing campaign should focus on benefits valued by the students. Managers suggested waste and expense audits be conducted before, during, and after the implementation. Sustainability is important to many students and focusing on the

positive outcomes of this change would help gain students support. Demonstrating the amounts of waste produced by students prior to and following the implementation of trayfree dining is recommended for maximum impact. Printed information about the actual weight of waste may have an impact, but being exposed to the large volume of edible food requiring disposal may leave an overwhelming impression on these students.

Directors also recommended educating the students on the health benefits of trayfree dining including the relationship between portion control and calories consumed. The impact of such a nutrition education campaign on nutritional choices and personal growth should be assessed.

Finally, waste and cost audits are recommended prior to and throughout the implementation of trayfree dining. These audits will provide financial data for continued support of such a change. These data will also be useful in the development of educational campaigns for students. The physical waste can be used to demonstrate improvements based on the removal of trays. Information that supports sustainability in such facilities can be utilized to recruit students, promote the operation, and advance university operations within their national association.

### CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

This study evaluated the operational feasibility of implementing trayfree dining within a university dining facility. Recommendations for the facility management team were identified and were based on results of foodservice manager interviews and student focus groups. Previous research has examined the outcomes of trayfree dining in university facilities. The current study identified similar outcomes, such as decreased food cost, reduced waste, and fewer resources needed (Aramark, 2008; Karstens & Moe, 2009; Sodexo, 2008). This research also supplemented these findings with recommendations for implementation and success of trayfree dining. While the purpose of this study was focused on evaluating the feasibility of trayfree dining in a particular dining unit, the findings may be of considerable use to managers of other university operations considering this change.

Generally, student involvement, communication, and timing were indicated to be primary methods of successful trayfree implementation. While savings of resources and products were identified as benefits of trayfree dining, unexpected outcomes such as improved student satisfaction and lifestyle choice impact were described as additional benefits of this style of service. Future research in this area is recommended. Determining the impact of tray removal on student weight gain and lifestyle influence may contribute to the factors supporting such a change.

The research found that focus groups involving students can provide useful information. However, the impact of multiple participants can cause the discussion to divert to unrelated topics. The researcher recommends conducting individual interviews with students to obtain individual student's perspectives. This format may prevent the impact of peer influence and random topic introductions. The individual foodservice manager interviews provided useful information on specific topics while allowing additional questions to obtain more in-depth understanding of the topic.

Future work should focus on evaluating methods of communication and student education that can best benefit the implementation and continued success of trayfree dining. While past research, as well as the current study, demonstrate the environmental and financial benefits of trayfree dining, evaluation of the continued impact and

success of such a change is recommended. Determining whether introduction of this form of environmentally friendly service impacts students' selection and evaluation of academic institutions to attend would be interesting. Given that student recruitment and retention are vital to the success of colleges and universities, evaluation of a wide variety of sustainability practices that potentially impact students' institutional preferences is recommended.

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