Evaluation of a HACCP Pilot Program for the Food Service Industry

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ABSTRACT

Objective: To evaluate the efficacy and applicability of a HACCP-based program for use in restaurants.

Participants: A randomly selected sample of 16 intervention and 42 control full service, "stand-alone" restaurants with a minimum of 3 full-time food handling staff on duty per shift.

Setting: Six communities in Central West Ontario.

Intervention: The Critical Approach®, a HACCP-based program for use in restaurants, was designed in consultation with health inspectors and restaurant operators. It focusses on generic risk factors (Critical Control Points, CCPs) for food handlers rather than assessing specific menu items or foods; offers appropriate training of both management and staff; and encourages self-monitoring of CCPs by operators without extensive record keeping or retention.

Outcomes: Outcome indicators measured changes in three areas: the environment, knowledge, and behaviour.

Conclusion: Results suggest that among a subpopulation of restaurants, the program is acceptable to operators and capable of producing tangible results. Principles and methods of the program (i.e., an initial assessment of the site, working with the operator to identify and suggest improvements, and return visits to monitor compliance) may be transferable to other types of food service operations.

La traduction du résumé se trouve à la fin de l'article.

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Food-borne diseases are important contributors to human morbidity and mortality, and result in a significant cost to the health care sector.¹⁻³ Ensuring the quality of food in commercial establishments traditionally has been addressed through strategies of education and enforcement. Due to increased demand, reduced resources and the search for best practices in public health, interest in recent years has turned to the search for programs with proven effectiveness.

In response, the Ontario Public Health Research, Education and Development (PHRED) Partnership conducted a systematic review of literature on the topic.⁴ Using 9 databases and 84 key words, they were able to identify 57 relevant studies. Of these, 52 were found to be of weak methodological quality and 5 of moderate quality. The review did, however, uncover interest in the development of a program based on HACCP (Hazard Assessment, Critical Control Point) principles, even though a subsequent review of the literature found no example of an evaluation of its effectiveness in a food service setting.

Originally developed for use in the food industry to ensure that all food consumed is safe to eat, HACCP is a structured process control system that identifies where hazards might occur in the food production process and puts into place stringent actions to take to prevent the hazards from occurring.

Consequently, the Central West Food Safety Network, a collaboration of public health units in Central West Ontario, undertook a project to develop *The Critical Approach*®,⁵ a HACCP-based program for use in restaurants. Designed in consultation with health inspectors and restaurant operators,⁵ it focusses on generic risk factors (Critical Control Points, CCPs) for food handlers rather than assessing specific menu items or foods; offers appropriate training of both management and staff; and encourages self-monitoring of CCPs by operators without extensive record keeping or retention. The intervention consisted of three stages:

1. An initial visit/inspection to promote the approach and gather information regarding the nature, scope and needs of the organization.
2. A consultation to familiarize premises personnel with key concepts of safe food handling, to help in identifying generic CCPs where practical monitoring protocols can be implemented,

and to provide assistance in the development of a site-specific plan for tailoring the flow of food and monitoring generic CCPs.

3. A follow-up visit/inspection to determine the degree to which the intervention was implemented in the premises and an interview to determine why the program either was or was not used and what might be done to improve it.

The goal of this project was to evaluate the efficacy and applicability of *The Critical Approach*® using a prospective community trial with randomly selected test and control groups.

METHODS

Sample

The sample frame was all full service, “stand-alone” restaurants with a minimum of three full-time food handling staff on duty per shift from among six communities in Central West Ontario. Limiting the sample to stand-alone restaurants was done in order to exclude those franchises or chains with corporate food safety policies that could interfere with the planned intervention. In order to help avoid contamination, and ensure consistency in program delivery, plans called for the test and control groups to be drawn from comparable, but similar, communities: 3 test and 3 control. From this frame, a sample of 30 restaurants from the test and 60 from the control communities were drawn. In as much as most outcome measures were at either the nominal or ordinal level, a sample of this size was considered sufficient to identify both statistical and practical differences between the two groups.

Baseline measurement

The intervention consisted of introducing, in a consistent manner, the *Critical Approach*® program to the test group by trained staff from the health unit in which the restaurant was located. On the other hand, no change was made in either the type or frequency of inspections carried out in the control communities. Descriptive information and baseline data on outcome indicators were collected from all sites by the same independent auditors who were “blinded” both to the details of the program and which restaurants were to receive it.

TABLE I

Comparison of Intervention and Control Sites on Selected Characteristics

	Intervention Group (N=16)	Control Group (N=42)
Average number of kitchen staff per shift	3.0	4.3
Average number of staff with food handler training	1.0	1.9
Average number of management	1.6	2.1
Average number of management with food handler training	1.0	1.2
Average percent of staff with food handler training (pre-test)	51.1	48.5
Average percent of staff with food handler training (post-test)	61.9	67.1
Average percent of management with food handler training (pre-test)	65.6	54.8
Average percent of management with food handler training (post-test)	67.8	61.0

Post-test measure

Exactly one year following collection of the original baseline data, a second visit was made by the same independent auditors. The post-test audit was conducted to examine the same items as included in the pre-test. To help ensure consistency with regard to seasonal variations and daily procedures, the post-tests were carried out at the same time of year, same day of the week and approximately same time of day as the pre-tests.

A number of outcome indicators were identified *a priori* to the analysis as criteria upon which to evaluate the effectiveness of the program. These criteria were based on the goals of *The Critical Approach*® program and measured changes in three areas: 1) changes to the environment, 2) changes in knowledge, and 3) changes in behaviour.

For each outcome, it was assumed that the indicator of program success would be whether or not a greater proportion of the test group had adopted a desired change (moved from “no” to “yes”) than those in the control group.

RESULTS

Sample

The sample size for this study was intended to provide sufficient cases to identify statistically significant effects of the program. What was not anticipated, however, was the number of establishments that over the course of a year went out of business, changed ownership, or refused to participate in the post-test assessment. As a consequence, rather than the planned 30 test and 60 control sites, the analysis was carried out using a sample of 16 (53.3%) test and 42 (70.0%) controls.

Despite the fact that fewer than the planned number of restaurants participated in the study, it was important to determine whether the resultant test group was at all similar to the controls. A comparison of the two groups on a number of relevant characteristics (Table I) demonstrates that they were very similar.

Changes to the environment

First among the indicators of effectiveness were changes in the work environment. Results regarding the presence of cooling charts and cooking thermometers revealed that those premises in the test group were much more likely to have changed from not having them available to having them available (Table II). In the case of cooling charts, the difference was 31.3% vs. 0.0%, and for thermometers 72.7% vs. 29.6%.

Changes in knowledge

It is one thing, of course, to have materials available to improve food-handling practices. Knowing what to do with them is a different matter. In order to test whether the program had an effect on improving knowledge, comparisons were made between the proportion of staff in the test and control sites who became familiar during the intervention period with use of cooking thermometers and temperatures.

When the pre-test measurements were carried out, only one member of the kitchen staff in the test group, and less than 5% in the control group, knew how to calibrate a thermometer. In the year following introduction of *The Critical Approach*® in their restaurants, over 40% of kitchen staff in the test group knew how it was to be done while almost no change had occurred in the control group. Equally as impressive was the fact that every one of those restaurant operators in the test group who did not know the proper internal cooking temperature for food at the time of the pre-test did know it when asked as part of the post-test.

Changes in behaviour

A principal feature of *The Critical Approach*® program was to change the kitchen routine in restaurants in a way to reduce the risk of food-borne contamination. One important way to do this is by maintaining proper (both hot and cold) food temperatures. To make it easier for kitchen staff to monitor

TABLE II

Number of Intervention and Control Group Sites Answering Yes to Outcome Indicators and Percent Change from Pre-test to Post-test

Item	Intervention Group (N=16)			Control Group (N=42)		
	Pre-test	Post-test	% Change	Pre-test	Post-test	% Change
Changes to the environment						
Are cooling charts available?	0	5	31.3	0	0	0.0
Are thermometers available?	5	13	72.7	15	23	29.6
Changes in Knowledge						
Does staff know how to calibrate a thermometer?	1	7	40.0	3	4	2.6
Does the operator know proper cooking temperatures?	9	16	100.0	16	24	30.7
Does the operator know proper cold temperatures?	14	16	100.0	27	34	46.7
Changes in Behaviour						
Are charts used for recording hot holding temperatures?	0	4	25.0	1	1	0.0
Are cutting boards used to prevent cross-contamination?	13	16	100.0	31	38	63.6
Measures to keep raw and ready-to-eat foods separate?	14	16	100.0	27	33	40.0

their operation, they were provided with thermometers and charts for tracking hot holding temperatures.

Based on observations by the assessors, the program had a considerable effect on the use of temperature charts. At the time of the pre-test, none of those in the test group, and only about 2.5% in the control group, kept track of temperatures. One year later, one quarter in the test group were routinely charting temperatures, as opposed to no change among the control sites.

Using the same surface both for cutting raw meat and for food preparation introduces significant opportunities for cross-contamination. Consequently, one focus of *The Critical Approach*[®] was to persuade operators both to use dedicated cutting boards and to separate raw from ready-to-eat foods. Unlike temperature charts, the majority of operations both in the test and control groups already were using cutting boards at the time of the pre-test assessment. Nonetheless, among those who were not, 100% in the test group changed compared to 63.6% of the controls.

The situation with separating raw and ready-to-eat foods was similar to that with the use of cutting boards. At the time of the initial assessment, only three operations in the test group and nine in the control did not have proper practices in place. After the program, however, all of the delinquent test group locations were in compliance, compared to one third of the controls.

CONCLUSIONS

This trial represents the only known evaluation of an attempt to apply the principles of HACCP to the food service industry. It successfully demonstrated that among a sub-population of restaurant operations, such a program not only is acceptable to them, but

capable of producing tangible results. It also may be that the principles and methods of the program (i.e., an initial assessment of the site, working with the operator to identify and suggest improvements, and return visits to monitor compliance) could be transferred to other types of food service operations.

Although this trial provides evidence that *The Critical Approach*[®] may be an efficacious method for introducing the principles of HACCP to the food service industry, additional research is required to determine:

1. Whether or not the results can be reproduced and are statistically significant.
2. The program's applicability to a larger, representative population of operations.
3. Whether the results can be sustained, and the need and timing for follow-up of 'booster' sessions.
4. Which aspects of the program are most effective, and which need to be modified or eliminated.

5. If the principles, and effect, of the program provide the basis for a template for the food service industry which operators can use for the development of their own HACCP plan.

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RÉSUMÉ

Objectif : Évaluer l'efficacité et les conditions d'application d'un programme d'hygiène et de sécurité alimentaire de type ARMPC (analyse des risques et maîtrise des points critique) dans les restaurants.

Participants : Un échantillon de restaurants indépendants à service complet, sélectionnés au hasard, employant au moins trois préposés à la manutention des aliments à plein temps par quart de travail. L'échantillon était composé de 16 restaurants participants et de 42 restaurants témoins.

Lieu : Six collectivités du Centre-Ouest de l'Ontario.

Intervention : Nous avons utilisé un programme de type ARMPC (Critical Approach[®]) élaboré en consultation avec des inspecteurs-hygiénistes et des exploitants de restaurants. Ce programme est axé sur les facteurs de risque généraux (les « points critiques à maîtriser », ou PCM) des préposés à la manutention des aliments plutôt que d'analyser le menu ou les aliments servis. La direction du restaurant et les employés reçoivent la formation nécessaire, et le programme encourage l'autosurveillance des PCM par les préposés sans qu'il soit nécessaire de tenir ou de conserver des registres détaillés.

Résultats : Des indicateurs de résultats ont permis de mesurer les changements à l'échelle du milieu de travail, des connaissances et du comportement.

Conclusion : Les résultats donnent à penser que, dans la sous-catégorie de restaurants à l'étude, le programme est accepté par les préposés et peut donner des résultats tangibles. Les principes et la méthode du programme (évaluation initiale des lieux, collaboration avec le ou la préposé(e) pour cerner les lacunes et suggérer des améliorations, puis visites de suivi pour évaluer la conformité) pourraient être appliqués à d'autres types de services d'alimentation.