

Food Safety Risk Factors in Selected Outside Catering Enterprises in Nairobi, Kenya

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Submitted: 13th September 2017; Accepted: 9th November 2017; Published online: 22nd November 2017

Abstract

Outside catering requires preparation and service of food at a site away from the business establishment. The specialized requirements of this type of catering however produce many challenges in the preparation, production, transportation and service of food that may affect the safety of food exhibiting potential outbreak risks of food-borne illnesses. These procedures add to the increased risk of food contamination. The food safety risk factors exposed through these processes are what this study sought to investigate. The study focused on selected outside catering events in Nairobi targeting food handlers of outside catering events in the city. The sample size was 60 from which data was collected. The collected data was then subjected to Correlations and multiple linear regression and ANOVA for analysis. The results showed a significant positive relationship between the hygiene, food handling processes and personnel control of cross contamination habits; and food safety. The regression coefficient of the three independent variables: hygiene practices (-0.294), food handling process (0.042) and personnel control of cross contamination habits (-0.304) were positively and significantly related. In conclusion a positive change in control of cross contamination, enhanced food handlers supervision, control of food handling processes in firms offering outside catering services would ensure provision of safe food.

Key Words: Outside catering, Food, Safety, Ancillary services, Nairobi, Kenya

Introduction

The hospitality industry has in the recent years seen a wide expansion of the outside catering sector Rotich, Yego & Korir, (2012). This has been as a result of increasing number of business clients and public organizations contracting out their ancillary services. The main reason for this is that business organizations have chosen to concentrate on their core activities and use specialist support services to supply their catering and domestic needs, thus the evolution of events catering. The trend is expected to continue as budget conscious employers persist in focusing on the core activities and move to outside catering as a means of cost cutting (Jones, 1986).

Food-borne illnesses are a growing public health concern worldwide which results from food contaminated by pathogenic microorganisms, mycotoxins or chemical hazards. This concern is heightened by the changes in life-style and food consumption patterns worldwide as frequency of “eating out” is increases and commitment to food preparation at home is decreases (WHO, 2000).

The number of reported outbreaks of food-borne illnesses has been high, both in developed and developing countries (Osaili, Abu, Obeidat, Bawadi, Tayyem & Subih, 2013). However, the problem is aggravated in developing countries due to economic reasons, poverty, lack of adequate health care facilities, and scarcity of data regarding control of food-borne diseases. This greatly compromises the achievement of the Millennium Development Goals (particularly MDG 1, 4, 5 and 6). The safety of outside catered foods is therefore one of the

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most pressing health and safety issues facing most developing countries since it leads to both public health and social consequences.

Food poisoning cases linked to food sourced from outside caterers in Kenya have been reported in various parts of the country; for instance, 1 person died and 5 were hospitalized in May 2017, after contracting cholera from food served in a wedding event reportedly having been serviced by an outside caterer; Over 200 cases of Cholera were also reported in various parts of the country including the case of a 4- star rated hotel in the country and the leading conference and convention centre in Kenya (KICC) (Commentary on research and media reports on food safety, 18th July, 2017). In a funeral ceremony, 195 attendees suffered food poisoning after consuming food served at the funeral in Tshivhilwi Village Vhember District, Limpor province in South Africa (NICD, 2010). In addition during the 2010 FIFA World cup sporting event in south Africa, thirty incidences of food borne illnesses were reported five of which were specifically linked to the outside catered event. Food borne diseases have many adverse economic consequences. For example, the 1998 outbreak of cholera in Tanzania cost US \$36 million. In Nigeria, the Food and Drug Administration destroyed aflatoxin-contaminated food worth more than US \$200, 000 (CSPI, 2005).

In Kenya, the specialized requirements of catering produce many concerns of potential outbreaks of food-borne illnesses (Rotich *et al.*, 2012, Hertzman & Barrash, 2007). Outside catering in particular entails specialized requirements of preparation and service of food at a site away from the business, comes with a number of challenges. The procedure through which food is prepared, produced, transported and served have a bearing on the safety of the food and is prone to potential risks of outbreaks of food-borne illnesses.

Catered events therefore demand expediency in delivery that can heighten the stress levels of employees given the large number of people that are served when food is transported to off-site locations. In addition food must be kept at proper temperatures en route and at the serving location.

Kotscheven and Terrel (1977), state that service occurs during the span of time between completion of production and presentation of the food to the customer. Its quality is likely to be at its most fragile point of excellence. The effective functioning of the service therefore depends on planning, selection of equipment to meet specific needs and a good flow of travel from customer order to service of food. Variables such as these add to the increased risk of food contamination, these food safety risk factors are what this study sought to investigate. The authors mainly sought to identify food safety risks factors associated with hygiene in the selected outside catering events, to examine food handling processes that pose food safety risks in the selected outside catering events and finally to assess personnel control of cross contamination habits that pose a risk to the safety of food in the selected outside catering events. The study was based on the following hypotheses:

H₀₁: There is no significant relationship between hygiene and food safety risks in outside catering events.

H₀₂: There is no significant relationship between food handling processes and food safety risks in outside catering events.

H₀₃: There is no significant relationship between personnel control of cross contamination habits and food safety risks in outside catering events.

Literature Underpinning

Concept of Food Safety

Food produced, served and consumed is of utmost importance to everyone, but more so to those who habitually eat outside their homes and are unaware of the intrinsic quality of food that is served to them (Sethi & Murphy, 2008). Food poisoning may occur if food containing poisonous chemicals or of biological origin is eaten. According to Karas *et al.* (2001) most food poisoning incidents occur as a result of unhygienic behavior of humans in addition to inappropriate food handling practices. The human body is itself a potent source of food poisoning organisms, which are transferred easily from the mouth, nose and bowel to food. Pathogens can be “carried” and passed on to others by individuals who are themselves not ill (carriers). Such carriers may have recently suffered an attack of food poisoning and still be harboring the organisms in their body. In some instances, carriers of food poisoning organisms act as “hosts” over a period of many years having themselves acquired immunity to the organism concerned (Clayton & Griffith, 2004).

Food Safety Risk Factors in Outside Catering

Any enterprise that handles the public’s food has potential for occurrence of food borne illnesses within their operations. The prevention of food borne illness through awareness and practicing appropriate food handling habits must be stressed by the establishments to their employees. Roberts, Barrett, Howells and Brannon (2008) noted that the three most significant contributors to food borne illnesses in catering establishments include: poor hygiene practices, improper food handling practices and cross contamination.

Hygiene and Food Safety Risks

High standards of hygiene minimize food spoilage and help to ensure that when food is eaten, it is as wholesome and as free from pathogenic bacteria, harmful viruses and moulds as possible. Food handlers are expected to practice appropriate safety measures that prevent the passage of contaminants. However, according to Clayton and Griffith (2004), the quantity of inappropriate actions performed by the food handlers are excessive. Hertzman and Barrash (2007) conducted a study that investigated the knowledge that catering employees possess regarding personal hygiene practices and other food safety concerns. This study demonstrated that many of the employees violated several of their hygienic responsibilities. Major personal hygiene violations reported included: failure to wash hands after touching the body, surfaces or uniform among others, not wearing gloves while working with ready-to-eat foods, failure to wash hands before engaging in the catering event, and drinking out of improper containers near food. Similarly, other studies have had hygiene as a significant risk factor in spreading food borne illnesses (Karas *et al.*, 2001; Guzewich, 1995).

Food Handling Processes and Food Safety Risks

Safe steps in food handling, cooking, and storage are essential to prevent food borne illness since we cannot see, smell, or taste harmful bacteria that may cause these illnesses. In every step of food preparation, adequate procedures are necessary to keep Food Safe. Contamination of food can be avoided by ensuring the following processes are adhered to; keeping raw and cooked food separately, using separate working surface for raw and cooked foods, keeping animals, birds and insects out of food areas, avoiding use of wash basins for food preparation or food preparation sinks for washing hands. Microorganisms grow fastest between temperatures of 5°C to 75°C, therefore when heating, cooling, or holding foods prior to or during service, the potential for bacterial growth is increased if not heated to the proper temperature, held at the proper temperature, or if held too long at unsafe temperatures (NRAEF, 2004).

There are specific guidelines that state foods must be heated to particular temperatures, held at certain temperatures if food is set out for a long period of time, as well as the proper techniques for cooling food for storage. Foods must be kept at certain temperatures to achieve the safest potential for consuming and to control food temperatures is an effective way of limiting and preventing the multiplication and production of toxins in the food. However, contrary to this, a study by Hertzman and Barrash (2007) found a major concern relating to food handling; whereby employees could move food from temperature-controlled environments without the temperatures being monitored.

On cooking temperature and time; there is need to cook food thoroughly, observing sufficient cooking times and temperatures to ensure that all bacteria and their toxins are destroyed. If bacteria present in food are not killed when food is being cooked they may multiply when it is cooking through the “danger zone” or if it is kept in the temperature zone before being served. Meat and poultry should be completely defrosted before cooking. If this is not done, some bacteria or bacteria spores may survive the cooking process.

Other temperature control measures of concern in food safety are: Cooked foods to be refrigerated must be cooled as quickly as possible to below 10°C before being placed in the refrigerator or cold room. The ideal place for this is a cool room or chiller with slatted shelves on which food is placed. All foods being cooled should be placed in clean containers. Any splash marks should be wiped off; cooled meats should be placed on clean trays for cool storage. Food should be covered with clean muslin to allow the heat to escape and prevent flies, dust or dirt from coming into contact with the meat.

Food being kept for service should be kept at temp not less than 63°C, employees must observe correct food handling processes and ensure catering areas are free from contaminants. Catering servers need to be aware of proper sanitation procedures of the equipment that they use every day in the operation. According to the FDA Food Code, utensils need to be sanitized before use then, cleaned and stored properly to prevent contamination (USFDA, 2009).

Food must always be prepared on clean surfaces. No food scraps must be allowed to accumulate between the joints of tables or corners where the tables are close to the walls. Table tops must be thoroughly scrubbed with hot water and a detergent, rinsed and dried. The chopping surface of butcher’s block must be washed, but scrapped with a metal scrapper to remove all particles of meat, sprinkled with salt and scrubbed with a wire brush. The block becomes impregnated with salt, which prevents growth of bacteria. Chopping boards must be thoroughly washed after use, rinsed and dried (Griffith, 2000).

Food mincing machines and slicing machines must be dismantled, cleaned and sterilized after use, using a sterilizing agent or boiling water with detergent. Refrigerators and cold rooms must be kept clean and maintained at the correct temperatures; scraps of food must not be allowed to accumulate in corners or on shelves. Regular cleaning and defrosting is essential and this includes washing all internal surfaces and racks with a solution of water and bicarbonate of soda or an approved cleansing agent (Griffith, 2000).

All premises where food is prepared or stored must be clean and in good repair and should be suitable for the purpose. The areas must be well ventilated and the walls and floors must have suitable coverings. All toilets must be kept clean and have the necessary notices displayed in the prominent positions. There must be sufficient sinks for washing food and equipment. Sterilizing sink must be available in working order. The water supply must be wholesome

and from the mains. An ample supply of hot water must be readily available. A suitable area for storing waste food awaiting collection with hygienic covered bins must be provided. Vehicles used for carrying unprotected foods such as meat, poultry, fish, bakery goods, cooked meats and dairy products must be kept clean and hygienic at all times. Frozen foods must be delivered in vehicles which have deep-freezers to maintain the necessary temperature of -20°C . All unprotected foods must be placed on clean trolleys and taken to the correct storage area immediately on delivery (Griffith, 2000).

Cross Contamination and Food Safety

Cross-contamination is when bacteria or viruses are spread from a contaminated source to food or surface. The bacteria can transfer from hand to food; when contaminated hands handle cooked or ready to eat foods and, food to food Contamination; when harmful organisms from one food contaminate other foods (Clayton & Griffith 2004).

How to prevent cross contamination

Hand to food contamination can be prevented by; washing hands properly, covering cuts, sores and wounds, keeping fingernails short, unpolished & clean, avoiding wearing jewelry, except for plain ring, washing hands before beginning food preparation, putting on disposable gloves, not serving customers after using the restroom, not smoking, chewing tobacco & gums in food preparation areas, not touching or scratching a part of the body while preparing food, avoid coughing, sneezing, handling garbage and touching dirty surfaces during food production (Kaferstein, Motarjemi & Bettcher, 1997).

Food to Food contamination on the other hand can be prevented by storing cooked foods that will not be prepared in a higher refrigerator compartment than raw foods. Best to practice; do not mix left over foods with fresh foods, wash fruits & vegetable in cold running water, do not let raw meat and raw vegetables be prepared on the same surface at the same time (kaferstein *et al.*, 1997).

In preventing equipment to food contamination; use separate cutting boards for different foods (meat and vegetables), Prepare raw foods in separate area from fresh and ready to eat foods, Clean & sanitize equipment, wash surfaces and utensils after preparing each foods, Use specific containers for various food products. Make sure cloth and paper towel used for wiping spills are not repeatedly used (Kaferstein *et al.*, 1997).

Theoretical Development

This study was guided by the Systems Theory advanced by Bertalanffy (1950). The systems theory approach is based on the notion that outside catering event can be visualized as a system. A system is a set of interrelated parts that operate as a whole in pursuit of common goals. According to the systems viewpoint, an organizational system has four components: inputs, transformation processes, outputs and feedback. This study aligned outside catering events to a system in which inputs include food ingredients, people handling the materials and equipment and facilities used. The transformation stage involved the processes of preparation, cooking and delivery of the food to the event venue, while outputs were the actual food served to customers and the related elements of service. Feedback was the wellness or illness of customers after consumption of food.

Methodology

The research design chosen for this study was a descriptive survey design and a quantitative approach was used to enable the appreciation of the concepts (Gall & Borg, 1997). The target

population was food handlers (food service and production) of the outside catering events. Nairobi was chosen for this study being the capital city of Kenya, where both local and international events often take place and meals of which are mostly outsourced. It is known to host most events than any other city or town in Kenya. To obtain the sample respondents for the study, a list of all enterprises that provide outside catering services for large events in Nairobi was obtained to serve as a sampling frame. The sampling frame constituted 218 outside catering enterprises. A sample of at least ten percent (30) enterprises that provide outside catering services were selected using simple random sampling (Mugenda & Mugenda, 1999).

From the selected thirty outside catering events enterprises, two food handlers working for the enterprises were selected using simple random sampling to inform the study. The total sample size of the study was 60 respondents, however 52 questionnaires were analysed representing an 87% response rate. The study considered collection of primary data using self-administered questionnaire for the food. The data was therefore quantitative in nature and measured in the interval scales, since it is a precise method for measuring variables. A 5-point Likert-type scale, described by 'always' (= 5) and 'never' (= 1) was used. The pre-testing was done to refine the instruments used to ensure validity and reliability. Reliability was done through the inter-item consistency reliability test, Cronbach alpha.

Descriptive statistics used included mean, standard deviation, minimum, maximum, frequencies and percentages. To test the relationships between the variables correlation and regression analysis were used. The hypotheses were finally tested by use of analysis of variance (ANOVA).

Results

Demographic Characteristics of Respondents

The food handlers' demographic characteristics were assessed on the basis of age, gender, marital status, Education, area of specialization, job title, duration in the current organization and the employment status. The study findings are summarized in Table 1.

Table 1. Demographic characteristics of the Food Handlers

Demographic Characteristics	Description	Frequency	Percentage %
Age	Below 25 years	16	30.8%
	26-30 yrs	19	36.5%
	31-40 yrs	13	25%
	Above 40 yrs	4	7.7%
	Total	52	100%
Gender	Male	13	25%
	Female	39	75%
	Total	52	100%
Marital Status	Married	20	38.5%
	Single	27	51.9%
	Widowed	4	7.7%
	Divorced	1	1.9%
	Total		100%
Level of Education	Primary	6	11.5%
	Form four level	19	36.5%
	Form six level	11	21.2%
	College	16	30.8%

	Total	52	100%
Work Experience	Below 2 yrs	6	11.5%
	2-5 yrs	23	44.3%
	5-10 yrs	13	25%
	Above 10 yrs	10	19.2%
	Total	52	100%
Employment Status	Permanent	28	53.8%
	Casual	24	46.2%
	Total	52	100%

Majority (36.5%) of the food handlers were aged between 26 to 30 years, followed by 30.8% aged 25 years and below, 75% of the food handlers were female while 25% were male. The results inferred that outside catering food industry is mostly handled by females. Majority (51.9%) of the food handlers were single while 38.5% were married. The highest number (36.5%) of the food handlers had attained form four (o-level) as their highest level of education, followed by 30.8 with college education and evident that there were food handlers with as low as having attained only the primary level certificate. Amongst those who had attained college majority reported to have specialized in food production and service courses.

To establish the level of staff turnover in the industry, the authors sought to find out the number of years the food handlers had served in their current organizations. The findings showed that most (44.3%) of the food handlers had served in their current organization for less than 2 years, followed by 25% who had served for 2 to 5 years. It can be inferred that majority of the food handlers had served for a short term. On the employment status of the food handlers, majority (53.8%) were permanent employees while 46.2% worked on a casual basis.

Hygiene Practices and Food Safety

Investigated in this paper was the relationship between hygiene practices and food safety. Food handlers were asked to show the extent to which they practice the expected hygiene standards on a scale representation of; Always (5), Very often (4), often (3), rarely (2) and never (1) as shown in Table 2.

Table 2. Food Handlers Hygiene Practices

Responses	N	Min	Max	Mean	SD
Knives are not used to cut different food items without washing each time.	52	1	5	3.8	1.5
Cutting boards are cleaned before use	52	1	5	4.5	1.1
Work surfaces are cleaned before use	52	1	5	4.5	1.0
Equipment used during preparation are clean	52	1	5	4.6	0.9
Trays used for serving are clean	52	2	5	4.5	0.9
Tea cloths used by waiters are clean	52	2	5	4.6	0.9
There are different work surfaces for various categories of food	52	1	5	3.9	1.4
Kitchen and Service area is free from flies	52	1	5	3.9	1.2
Food is cooked for the required period of time	52	1	5	4.3	1.0
Kitchen personnel wash hands before touching food	52	1	5	4.3	1.1
Food items are washed before cooking	52	2	5	4.7	0.8

Results in Table 2 indicate that many food handlers very often do not use knives to cut different foods without washing each time (mean =3.8). Majority reported that they always wash cutting boards before use (mean 4.5), clean work surfaces before use (mean 4.5), ensure equipment used during preparation were clean (mean 4.6), ensured trays used for serving were clean (mean 4.5), ensured tea cloths used by waiters are clean (mean 4.6) and ensure that food items are washed before cooking (mean 4.7). In addition, quite a number of the food handlers reported that they very often ensured that there are different work surfaces for different categories of food (mean 3.9), ensured kitchen and service area is free from flies (mean 3.9), ensured food is cooked for the required period of time (mean 4.3) and Kitchen personnel washed hands before cooking (mean 4.3).

Food Handling Processes and Food Safety

To establish the relationship between food handling process and food safety food handlers were asked to give the extent to which they followed given food handling process on a likert scale of 5-1. The findings are presented in Table 3.

Table 3. Food Handling Practices by the food handlers

Responses	N	Min	Max	Mean	SD
Food is cooked at the right temperatures	52	2	5	4.2	1.0
Equipment used to hold cooked food are clean	52	1	5	4.1	1.2
Food is served hot	52	1	5	3.9	1.1
Food is not held for long before service/consumption	52	1	5	3.5	1.5
Disposal bins are well covered	52	1	5	3.2	1.3
Fallen food is not picked up and served	52	1	5	3.2	1.8
Meats and vegetables are not mixed at any time	52	1	5	3.5	1.7
Food leftovers are disposed after clearing	52	1	5	4.1	1.3
Kitchen & service staff have medical health certificates	52	1	5	3.6	1.5
Personnel wash hands before serving	52	1	5	4.1	1.2
Personnel wash hands after disposing food	52	1	5	3.7	1.4
Table cloths used are clean	52	2	5	4.4	1.0
Plates used to serve food are clean	52	2	5	4.6	0.8
Kitchen and service area floors are cleaned frequently	52	1	5	4.1	1.2

Study findings in Table 3 depict that majority of the food handlers reported that they always ensure that plates used to serve food were clean (mean 4.6). Further, majority of the food handlers reported that they very often ensured that food was cooked in the right temperatures (mean 4.2), equipment used to hold food were clean (mean 4.1), food was served when hot (mean 3.9), food was not held for long before service/consumption (mean 3.5), food leftovers were disposed after clearing (mean 4.1), meat and vegetables were not mixed at any-time (mean 3.5), kitchen and service staffs all had medical health certificates (mean 3.6), all personnel wash hands before serving (mean 4.1), all personnel washed hands after disposing food (mean 3.7), table clothes used were clean (mean 4.4) and kitchen and service area were cleaned frequently (mean 4.1). It was important to note that majority of the food handlers often ensured that disposal bins were well covered (mean 3.2) and fallen food was not picked up and served (mean 3.2).

Cross Contamination and Food Safety

The study aimed at investigating the relationship between personnel control of cross contamination habits and food safety thus food handlers were asked to indicate the extent to which their personnel practiced control of cross contamination. The findings are shown in Table 4.

Table 4. Food Handlers Control of Cross Contamination habits

Responses	N	Min	Max	Mean	SD
Staff maintain short nails	52	1	5	4.4	1.0
Hands are washed after using the toilets	52	2	5	4.6	09
Personnel do not sneeze in food areas	52	1	5	4.0	1.3
All burns and cuts are well covered	52	2	5	4.3	1.0
Staff don't work when they have coughs and colds	52	1	5	3.1	1.4
Staff change uniforms daily	52	1	5	3.8	1.3
Staff wear clean working clothes	52	2	5	4.4	0.9
Staff handle food as little as possible	52	1	5	3.8	1.3
Staff keep hands off hair, nose, open wounds	52	1	5	4.1	1.3

From the findings, it is evident that majority of the food handlers always ensured that hands were washed after visiting toilets (mean 4.6). Food handlers reported that they very often ensured that their staffs maintained short nails (mean 4.4), personnel did not sneeze in the food areas (mean 4.0), all burns and cuts were well covered (mean 4.3), staffs wore clean working clothes (mean 4.4), staff handled food as little as possible (mean 3.8) and staffs kept their hands-off hair, nose or open wounds (mean 4.1). Majority reported that they often did not allow their staffs to work when they had coughs and colds (mean 3.1).

Safety of Food

The study sought to establish how often chances of unsafe food was encountered by the outside caterers. Study findings are summarized in table 5.

Food Handlers Encounters of Unsafe Food

Study findings in Table 5, depict that majority of the food handlers reported that they rarely served food with a pungent smell (mean 3.7), served food discolorations (mean 3.9), recycled leftover food (mean 3.9), received customers reports on stomach upsets (mean 4.1), customers complaints after being served with cold food (mean 3.5) and customers did not wash their hands before eating (mean 3.7).

Table 5. Food Handlers Encounters of Unsafe Food

Responses	N	Min	Max	Mean	SD
Food served has a pungent smell	52	1	5	3.7	1.5
There is discoloration of food	52	1	5	3.9	1.4
Leftover food is recycled	52	1	5	3.9	1.4
Customers complain of cold food	52	1	5	3.5	1.4
Customers report of having stomach upsets	52	1	4	4.1	1.1
Customers do not wash their hands before eating	52	1	5	3.7	1.3

Correlation and Regression Analysis

The correlation matrix in Table 6 indicates that according to the food handlers, food safety was positively correlated with hygiene practices (0.399). Thus, an improvement in the hygiene was associated with higher chances of safe food. It was important to note that there was a positive relationship between food safety and food handling process (0.362). Food safety positively correlated with control of cross contamination habits (0.416).

Table 6. Correlation Matrix for Food Handlers

	Food safety	Hygiene practices	Food Handling Processes	Control of Cross Contamination habits
Food safety	1	.399*	.362*	.416*
Hygiene practices	.399*	1	.676*	.676*
Food Handling Processes	.362*	.676*	1	.844*
Control of Cross Contamination habits	.416*	.676*	.844*	1

*Significant at 5% Level of Significance

Regression Model Summary of food handlers

Coefficient of determination (R^2) in Table 7 was reported to be 0.2, indicating that 20 percent of the total variation of dependent variable (food safety) according to the food handlers is explained by hygiene practices, food handling processes and personnel control of cross contamination habits.

Table 7. Food Handlers Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.447	0.200	0.146	0.80059

Predictors: (Constant): Personnel control of cross contamination habits, Hygiene practices, Food Handling Processes

After testing the R squared the authors also investigated the overall validity, reliability and goodness of fit of the model using analysis of variance ANOVA. This is shown in Table 8. The F value indicates 3.740 which is a larger value at a significance level of ($p < 0.05$), therefore the null hypothesis was rejected and concluded that at least one coefficient is none zero hence there is a significant linear relationship between hygiene practices, food handling process, personnel control of cross contamination habits and food safety according to the food handlers.

Table 8. ANOVA (Analysis of Variance) for Food Handlers

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.191	3	2.397	3.740	0.018
	Residual	28.842	49	.641		

Total 36.033 52

Dependent Variable: Food safety

Predictors: (Constant), Personnel control of cross contamination habits, Hygiene practices, Food Handling Processes

Table 9 depicts a positive linear relationship between hygiene practices and food safety ($\beta = 0.294$), it implies that according to the food handlers in order to have a positive unit change in food safety then we must increase the chances of food (r) hygiene by 0.294. In addition, there was a positive linear relationship between food handling processes and food safety ($\beta = 0.042$), thus it can be inferred that an increase in proper food handling processes by 0.042 increases the chances of safe food by one unit. More so, there was a positive linear relationship between food safety and personnel control of cross contamination habits ($\beta = 0.304$), thus it can be inferred that a positive unit change of safe food is associated an improvement of .304 units of personnel control of cross contamination habits. The regression coefficient depicted in Table 9 show that all the three independent variables: hygiene practices (-0.294), food handling process (0.042) and personnel control of cross contamination habits (-0.304) were positively and significantly related to food safety.

Table 9: Food Handlers Model Co-efficient

Model		Beta	Std. Error	t	Sig.
1	(Constant)	1.475	.764	1.930	.060
	Hygiene practices	-.294	.242	1.214	.231
	Food Handling Processes	-.042	.271	.155	.818
	Personnel cross contamination control habits	-.304	.264	1.153	.255

The results suggest that food safety can be represented as a function of hygiene, food handling processes and personnel control of cross contamination habits, the specific function is of the form

$$Y = 1.475 + 0.294 X_1 + 0.042 X_2 + 0.304 X_3$$

Where: Y = Food safety

X_1 = Hygiene practices

X_2 = Food handling processes

X_3 = personnel control of cross contamination habits

The results further indicate that, when food handling processes and personnel control of cross contamination habits are held constant, a 1% increase in good hygiene practices is likely to result in a 0.294% increase in food safety. Similarly, when food hygiene practices and personnel control of cross contamination habits are held constant, a 1% increase in proper food handling processes is likely to lead to a 0.042 % increase in food safety. However, while holding hygiene practices and food handling processes constant, food safety would increase

by 0.304% for a 1% increase in personnel control of cross contamination habits. On the basis of the t-values, hygiene practices with a t-value of 1.214 and personnel control of cross contamination with a t-value of 1.153 are the main predictors of food safety.

Hypothesis Testing

Testing the effect of food hygiene practices on food safety

Hypothesis H₀₁ postulated that there is no relationship between food hygiene practices and food safety in outside catering events. The regression coefficient indicated that there is a positive and significant statistical relationship between hygiene practices and food safety in outside catering provided by the selected outside catering enterprises in Nairobi ($\beta=0.294$, $p<0.005$). It was concluded that there was sufficient evidence at the 0.05 level of significance to suggest that hygiene practices has a positive effect on food safety in outside catering in Nairobi. The hypothesis was therefore not accepted.

Testing the effect of food handling processes on food safety

Hypothesis H₀₂ postulated that there was no relationship between food handling processes and food safety in outside catering in Nairobi. The regression coefficient indicated that there is a positive and significant statistical relationship between food handling processes and food safety in outside catering in Nairobi ($\beta=0.042$, $p<0.005$). It was concluded that there was sufficient evidence at the 0.05 significance level to suggest that that food handling processes has a positive effect on food safety in outside catering services provided by the selected enterprises in Nairobi. The hypothesis was therefore not accepted.

Testing the Effect of personnel control of cross contamination habits on Food Safety

Hypothesis H₀₃, postulated that there was no relationship between personnel control of cross contamination habits and food safety in outside catering in Nairobi. The regression coefficient indicated that there is a positive and significant relationship between food handling habits and food safety ($\beta = 0.304$, $p<0.005$). It was concluded that there was sufficient evidence at the 0.05 significance level to suggest that personnel control of cross contaminations habits positively affects food safety in outside catering in Nairobi. The hypothesis was therefore not accepted.

Table 10: Summary of the hypothesis testing

Hypothesis	β(t-value)	P	Result
H ₀₁ : There is no significant relationship between hygiene practices and food safety	0.294(1.214)	0.323	Not accepted
H ₀₂ : There is no significant relationship between food handling processes and food safety	0.042 (0.155)	0.863	Not accepted
H ₀₃ : There is no significant relationship between personnel control of cross contamination and food safety	0.304(1.153)	0.254	Not accepted

Discussion

The Relationship between Hygiene Practices and food safety

Regarding the food hygiene practices the food handlers reported to have adhered to the laid down procedure to ensure that food safety was attained. The inferential statistics both correlation and regression analyses showed a significant positive relationship. Thus, a positive change in hygiene would lead to increased chances of safe food and vice versa. Hand washing habits of the respondents showed a mean of 4.3. These findings are similar to a study conducted in the UK acknowledged that caterers are aware of the necessity of proper hygienic routines and that they were able to state reasons for this consistent behavior; that is, an activity or conduct that supports reducing the passage of food borne pathogens (FSA, 2000). However, acknowledging the importance of a behavior does not guarantee that an individual will consistently practice that behavior.

Concerning food hygiene, majority of the food handlers ensured high standards of food hygiene. They reported that they often practiced the following: washed cutting boards before use, cleaned work surfaces before use, ensured equipment used during preparation were clean, trays used for serving were clean, tea cloths used by waiters were clean and ensured that food items are washed before cooking, use of different work surfaces for different categories of food and ensured that kitchen and service areas were free from flies. These findings are similar to those of Hertzman and Barrash (2007) in the study that investigated knowledge possessed by catering employees regarding personal hygiene practices and other food safety concerns. This study finding implies that if there are any hygiene practice violations, then it is not out of ignorance.

The Relationship between Food Handling Practices and food safety

In this paper, the study findings depicted a positive relationship between food handling process and food safety. This means that in order to minimize the chances of unsafe food, the food handlers should improve their food handling processes. The food handlers reported that they very often ensured that food was cooked in the right temperatures, served when hot, not held for long before service/consumption, food leftovers were disposed after clearing, meat and vegetables were not mixed at any-time, kitchen and service staff all had medical health certificates, These findings are however contrary to Clayton and Griffith's (2004) findings where the quantity of inappropriate actions performed by the food handlers was excessive.

Important processes that ensured safety of food yet commonly violated include: keeping raw and cooked food separately, the same working surface used for raw and cooked foods;

surfaces used for raw foods should be thoroughly cleared afterwards. Keeping animals, birds and insects out of food areas. Contrary findings are those of Hertzman and Barrash (2007) who found a major concern relating to food handling. When employees could move food from temperature-controlled environments, the temperature was not monitored. This violation is quite alarming, especially if management was not aware of the situation. When food temperature is not properly monitored, food could be contaminated with growth of bacteria.

Relationship between Personnel Control of Cross Contamination & food safety

The study findings depicted a positive relationship between personnel control of cross contamination habits and food safety, thus according to outside catering food handlers positive change in personnel control of cross contamination will be associated with a positive chance of safe food. The food handlers should embrace positive policies when handling food as they offer the outside catering services. In this study majority of the food handlers of outside catering, very often ensured that hands were washed after visiting toilets that they maintained short nails. They ensured all burns and cuts were well covered, and staff wore clean working clothes. They reported that food was handled as little as possible and staff kept their hands-off hair, nose or open wounds and, staff were not allowed to work when they had coughs and colds. These findings are in agreement with (NRAEF, 2004) which states that a food borne illness can result if cross-contamination is allowed to occur in any of the following ways: raw contaminated ingredients added to food that receives no further cooking; food-contact surfaces not properly cleaned; raw food-contact surfaces are not sanitized before touching cooked or ready to eat food; raw food allowed to touch or drip fluids onto cooked or ready to eat food

To prevent cross contamination, food worker must never touch food with their bare hands since this can place the food in direct contact with a surface that contains dangerous microorganisms especially food items safe to eat without cooking. If food workers are handling foods, there must be a barrier between the food workers' hands and the foods. Gloves are commonly used as barriers in food service establishments, and anecdotal evidence suggests that glove use for this purpose may be increasing Green *et al.*, 2006). Gloves should always be utilized for single-use and never be washed then re-used. Proper glove use can decrease the transfer of pathogens from hands to food (Michaels *et al.*, 2004). However, this study did not establish what the caterers use to prevent bare hands contact with ready to eat foods.

Conclusion

The negative linear relationship depicted by the study results showed that there is a general need for improved food handling practices by the food handlers. Therefore, it can be concluded that having good handling practices minimized chances of bad food. The key habits related to food safety include personal hygiene and preparing food on clean surfaces. All of these factors have serious implications for the safety of food in outside catering enterprises.

Recommendations

1. Outside caterers should strive to maintain high hygiene standards so as to eliminate chances of having unsafe food.
2. Outside caterers must also continuously monitor their food handling processes. Thus, to have safe food the outside caterers should have good internal controls to ensure that the food preparation safety standards are not compromised.

3. Finally, outside caterers should have good measures to ensure that they have attained the highest cross contamination control standards during the outside catering events.

Future Research

Future studies can be carried out to investigate whether outside catering entrepreneurial have an effect on economic or social empowerment among the key players in the sector.

A follow up study should be done to investigate on the level of customer loyalty and outside caterers strategic positioning in relation to hygiene practices, food handling processes and control of cross contamination habits practiced by the outside caterers.

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