



Child Nutrition Programs in Kindergarten Schools Implemented by the Governmental Sector and Global Nutrition Consulting Companies: A Systematic Review

NOURA M. S. EID*

Faculty of Applied Medical Sciences, Department of Clinical Nutrition,
King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract

Child Nutrition Programs in schools are considered one of the best approaches towards improving diet and health. Yet it is considered a newly developed approach to be applied in Saudi Arabia. According to the ministry of health, undernutrition and obesity both are increasing in Saudi Arabia, due to various factors, which include both diet and environmental factors associated with schools and home environments. We have chosen a descriptive study to describe Child Nutrition Programs run by governmental sectors in United States and United Kingdom, in addition to global nutrition consulting companies in different countries, which included India and Singapore. The objectives of this review is to demonstrate successful Child Nutrition Programs approaches, strategies, tools, marketing plans and resources targeting pupils, parents, teachers and schools staff. Thus, this review supports implementing Child Nutrition Programs in Saudi Arabia, by choosing the most suitable strategies to improve child health and nutrition.



Article History

Received: 11 July 2018
Accepted: 26 October 2018

Keywords

Child Nutrition Programs;
Kindergarten Schools;
Nutrition Consulting
Companies;
Nutrition Meal Programs

Introduction

Global drivers have high impact on the need of Child Nutrition Programs, which include rising obesity among children¹ and rise in nutrition² and consumer awareness.³ Increasing problems associated with child obesity globally coupled with increasing number of nutrition programs, which are major factors

expected to fuel demand for these services in future.⁴ A study conducted by Dr Khalid Al Madani indicated that mothers and caregivers have developed an increased understanding about child nutrition, which in turn is expected to result in increasing opportunities for growth of the concerned market.⁵ Thus governmental approaches towards health

CONTACT Noura M. S. Eid ✉ Ooaeid2@kau.edu.sa 📍 Faculty of Applied Medical Sciences, Department of Clinical Nutrition, King Abdulaziz University, Jeddah, Saudi Arabia.



© 2018 The Author(s). Published by Enviro Research Publishers.

This is an Open Access article licensed under a Creative Commons license: Attribution 4.0 International (CC-BY).

Doi: doi.org/10.12944/CRNFSJ.6.3.07

promoting programs in schools are crucial, seen in most countries, where the government collaborates with schools, to ensure proper nutrition for children. Whereas in developing countries, such as Saudi Arabia there is a lack or nonexistence of Child Nutrition Programs collaborated with public or private schools to provide nutrition education, training, and learning resources related for teachers, parents and children.⁶ Child Nutrition Programs can be delivered in schools, clinics, child care centers, but most effective ones are those associated with schools via three main approaches, nutrition education, counseling, and the environment.⁷ There has been large disparity between developed and developing countries with regard to child nutrition intake and policies in schools, which does not exist in Saudi Arabia yet.⁶ Our previous work demonstrated an insight of the need and interest of parents and school principals in implementing Child Nutrition Programs showing positive attitudes. Both respondents are willing to invest in teacher/caregiver trainings and a demand on providing learning resources to support such programs was seen by book stores as well. However, the main barriers revealed by global consulting companies were high costs as a main one, followed by lack of awareness, high resistance and reluctance. Yet, factors contributing to implementing child nutrition programs are mostly parents pressure.⁸ Our objectives in this review is to provide enough information on existing Child Nutrition Programs, which are run by governmental sectors and global nutrition consulting companies in different countries, to be able to develop a cost effective Child Nutrition Program to be implemented in Saudi kindergarten schools.

Methodology

A systematic review of the literature on child nutrition programs, which provides nutrition services to schools, which included programs run by the United States Department of Agriculture USDA in the United States and programs run by the British Nutrition Foundation BNF in the United Kingdom. In addition to reviewing five successful business profiles via interviews of global nutrition consulting companies in different countries, which included the United Kingdom, India and Singapore.

Governmental Programs

There are several governmental programs to provide school meals to schools in the United States by United States Department of Agriculture (USDA)⁹ and in the United Kingdom by BNF British Nutrition Foundation.¹⁰ Both National School Lunch Program (NSLP) and School Breakfast Program (SBP) provides meals and snacks to students following recommended dietary intakes planned by dietitians, and also work on smarter lunchrooms, which is creating a healthy environment for kids in schools, with providing more healthy options, such as fruit, vegetables and grains. In addition to the afterschool snack program, which serves students that stay for an afterschool activity with low prices snacks. Furthermore, nutrition education for kids, caregivers and teachers has been seen with several programs, such as Child and Adult Care Food Programs (CACFP) and Summer Food Program (SFB), where a great selection of tools and learning resources are provided to promote health and wellness. This include recipes and cooking techniques , which is also seen by the British Foundation in the United Kingdom. BF provides a nutrition curriculum with 12 sessions to support children at different age groups starting from 3 to 5 years old, to schools in the United Kingdom. The structure of the curriculum include teacher training sessions, teacher's guide and children learning tools, which are excellent for the public use containing activities, and exercises. It is a great source for Saudi Arabia to start building their own curriculum following such program.

The following table describes the six main governmental nutrition programs run at schools in the United States by the United States Department of Agriculture (USDA) and the main program run by the British Nutrition Foundation (BNF) in the UK, where each of those programs uses different tools and resources;

According to the our descriptive study, we found out that most of the governmental programs run in the United States focus on supporting schools meals into a healthier diet. Some programs focus on Lunch rooms, food sources and training. However, the most effective type of program reviewed was the one carried

Table 1: governmental funded nutrition meal programs

Program	Important components/ tools and resources
<p>National School Lunch (NSLP) ^{(11, 12)(11, 12)(14, 15)} and School Breakfast Programs (SBP)</p> <ul style="list-style-type: none"> • The programs are designed to promote health and wellbeing of children by providing nutritious meals, • Participants: Public school districts, private schools residential child care institutions (RCCIs), and charter schools 	<ul style="list-style-type: none"> . Smarter Lunchrooms . Afterschool Snack Programs . Community Eligibility Provision . Bulletins and Memos . Sponsorships from Outside Organizations . Special Toolkits and Resources for Schools, School Districts, and Community Partners
<p>Child and Adult Care Food Programs (CACFP)</p> <ul style="list-style-type: none"> • It provides federal funds to non-residential child care and adult care facilities to serve nutritious meals and snacks • Participants: Non-residential, licensed public or private, non-profit child care centres or family day care homes 	<ul style="list-style-type: none"> . At-risk afterschool meals (federal funding to afterschool snacks and activities for nutrition education) . Culinary workshops • Sponsors . Workshop and resources on gardening etc.
<p>Summer Food Program (SFB)</p> <p>Under the program, the sponsor receives payments for serving healthy meals and snacks to children aged 18 years and younger</p> <ul style="list-style-type: none"> • Participants: Public and private schools 	<ul style="list-style-type: none"> . Sponsors . Workshop and resources
<p>Special Milk Programs</p> <p>Special milk programs provide milk to children in non-profit schools that do not participate in other child nutrition programs</p> <ul style="list-style-type: none"> . Participants: Public school districts, private schools, residential child care 	<ul style="list-style-type: none"> . Letter to households (for receiving free milk) <ul style="list-style-type: none"> • Application for free milk • Documents related to eligibility
<p>Food Distribution/USDA Foods</p> <ul style="list-style-type: none"> . Program provides protein-rich food, fruits and vegetables, poultry and eggs, nuts, grains, oils, and cheese to children . Participants: Local Education Agencies (LEAs), public and private schools, residential child care institutions (RCCIs), and approved state agencies 	<ul style="list-style-type: none"> . USDA Website . 'USDA mixing bowl' website devoted to cooking . USDA food toolkit for schools (for assisting professionals and students, school staff, community, etc.) . Handbooks
<p>Fresh Fruit and Vegetable Program</p> <ul style="list-style-type: none"> . Under the program, a variety of free fresh fruits and vegetables are provided to enrolled students in participating elementary schools through the school day, with the major objective being to combat childhood obesity. . Participants: All schools 	<ul style="list-style-type: none"> . Nutrition education resources such as books <ul style="list-style-type: none"> • Books with games and activities • Jokes on fruit and vegetables • Website resources . Sample menu with graphics
<p>British Nutrition Foundation (BNF)</p> <p>It is not-for-profit organization that promotes nutrition sciences in the U.K. The organization is supported by EU and other including online nutrition tutorial and training for teachers and parents. government agencies through projects and subsidies.</p> <ul style="list-style-type: none"> . Participants: All schools 	<ul style="list-style-type: none"> . Nutrition training across societies, schools, and modes of mass communication. . The organization also offers teachers training school curriculum through its BNF Education Program. . BNF generates revenue through several means, . The organization also collaborates with independent consultants and offers paid membership to gain access to BNF publications.

Table 2: Global Consulting Progrms

Program	Important components/ tools and resources
<p>Qua Nutrition is an India-based company founded in 2012. Qua Nutrition offers over five categories of counselling services, including child nutrition, nutrition for women, sports nutrition, therapeutic nutrition, and weight loss guidance</p>	<p>Strategies (services/partnerships)</p> <ul style="list-style-type: none"> - Company focuses on ensuring objectives are achieved in as few consultations as possible, which helps to gain trust and expand customer base . On an average, a client normally requires three consultations over a three-month period - Company is primarily focused on entering into partnerships with leading companies in order to expand service offerings <p>Development (innovative approaches)</p> <ul style="list-style-type: none"> - Company is primarily focused on expanding footprint by introducing services in domestic as well as international markets, where company expanded its services in Dubai as well - Company has initiated various new innovative services in India where it became the first nutritional clinic in India to conduct power breath measurements - In 2014, the company raised a fund of US\$ 1 Mn, and has reached current valuation at around US\$ 45 Mn
<p>Nutrition Café is a Company is a India-based nutrition training organization, founded in 2014 to provide nutrition related services such as nutrition programs and workshops, through four customer segments namely personalised nutrition, sports nutrition, corporate nutrition, and child nutrition</p>	<p>Strategies (services/partnerships)</p> <ul style="list-style-type: none"> - The company is focused on providing training and related guidance to mothers/caregivers and teachers of pre-schoolers. As a part of its service offerings, company provides education in video format to aid in explaining and demonstrating various nutritious foods and items to pre-schoolers - Company is more focused on entering into partnerships with leading companies in order to expand its service offerings, such as 'Millennium Sports Management' <p>Development (innovative approaches)</p> <p>Company has collaborated with two schools "Chatrabhuj Narsee Memorial School Mumbai (CNMS) and Jamnabai School Mumbai" in Mumbai and is in the process of expanding in client base in the near future.</p>
<p>SR Nutrition is a consultancy directed by registered nutritionist Charlotte Stirling- Reed, which was founded in 2007 in the UK. The consultancy serves various sectors including National Health Service (NHS), commercial companies, local authorities, charities, and schools. The company places more importance on nutrition for five- year olds and below, by presenting and displaying a variety of foods and serving food in different ways, and promoting a stress-free mealtime atmosphere</p>	<p>Strategies (services/partnerships)</p> <ul style="list-style-type: none"> - Providing quotes and nutritional advice via various media channels, via magazines, such as Mother & Baby, which is also featured on the online site and via Radio and Television. - The company collaborates with various organizations that offer nutrition education for children, and training on nutrition to healthcare professionals focused upon childhood obesity <p>Development (innovative approaches)</p> <ul style="list-style-type: none"> - Charlotte worked to develop Curb HQ — a weight loss application – offering complex nutrition projects. - SR Nutrition has developed partnerships with research groups to conduct research and promote nutrition education, such as the DEMOS — a research

Judy More Child Nutrition Consultancy was founded in 2000 in the UK. Judy is a former registered paediatric dietitian in NHS hospitals and community trusts. The major focus of the company is on child nutrition, where she sees parents and children for individual consultations. Company's service offerings include individual consultations, researching and advisory, training courses, media spokesperson, public speaking, writing books and articles, and lecturing on infant and child nutrition at universities

Pure Vitality Nutrition Concepts was founded in 2013 in Singapore is run by Karen Aroney, an accredited nutritionist and wellness coach. Company has been providing child nutrition services via individual consultations, 5-session Pure Vitality Individual Package, and corporate & group consultations, workshops, lectures, and health talks

firm focused upon debates on policies, providing research and hosting events and also participated in Early Years Research, a focus group research conducted by DEMOS.

Strategies (services/partnerships)

- The consultancy provides its services to a number of diversified clients including government organizations, private companies, publishers etc. Some clients of Judy More Child Nutrition Consultancy are Coca-Cola, Dairy Council, Demos, Infant and Toddler Forum, Department of Health, NICE National Institute for Health, and Care Excellence etc

- The company is associated with over 25 schools and is the process of expanding its nutrition business in more schools in the near future.

Development (innovative approaches)

Judy More Child Nutrition Consultancy also offers a number of books on infant, child, and adolescent nutrition, such as 'Infant, Child, and Adolescent Nutrition', "Stress-Free Weaning", "Happy Toddler Mealtimes" and "The Big Book of Recipes for Babies, and Toddlers and Children's"

Strategies (services/partnerships)

- writing articles on healthy meals, such as "20- Minute Healthy Meal Recipes" and "Canadian Thanksgiving- Main meals"

- Partnership with So Spa (Sofitel Singapore) – a Singapore based resort and spa- for providing workshops on nutrition education to its members, such as 'how to build a healthy relationship with food' and also available for private consultation on same day

Development (innovative approaches)

Karen provides health talks on motherhood and nutrition at Woolf Works - a female- oriented community in Singapore

by the British Nutrition Foundation (BNF), where a curriculum has been established to be taught in all local schools for both primary and elementary grades. In addition a combination of cooking and nutrition education was created in collaboration with Jamie Oliver Food Foundation. Food a Fact of Life is the name of the curriculum providing variety of educational material and learning resources, for all age groups in schools, that include learning material, teacher guide, online training sessions,, teaching recipes and class preparation guide for cooking classes and several supporting sources, which can be accessed in their website. Furthermore, a curriculum support is provided for teachers, in addition to Continuous Professional development

sessions providing the chance for schools to be members and benefit from other services. What is also effective in the program is the involvement of food providers in educating children in breakfast clubs, school meals and packed lunches to improve health wellbeing following the food school standards. The BNF is considered an excellent model for Saudi Arabia to adapt in collaboration with the ministry of education so teachers can deliver the nutrition content effectively to teachers, staff, mothers and children. So far in Saudi Arabia most of the nutrition education carried in schools are community initiatives carried by health professionals, students and academics which lack consistency, accuracy, and follow up. This program may have a significant

impact on teachers, students and mothers, which would definitely reflect the community health in the future.

Global Consulting Companies

We have reviewed five different consulting companies that provide Child Nutrition Programs to schools, which are Qua Nutrition,¹³ Café Nutrition,¹⁴ SR Nutrition,¹⁵ Judy More Consultancy,¹⁶ and Pure Vitality Pure Concepts,¹⁷ and collected information on the company profile, strategies and developments which include services, partnerships, marketing, and innovative approaches in Table 2. We have observed that both Qua Nutrition and Café Nutrition based in India provides child nutrition programs but in different approaches, where Qua Nutrition base their services on consultations mostly, and café nutrition on training workshops. Education via workshops are proved to be more effective than counseling, where it influence attitudes and beliefs that was demonstrated in meal planning, food preparation and cooking practices by parents, and better choices of foods when it comes to children.¹⁸ Regarding one to one consultations, is it considered an effective strategy when needed for specific health concerns, where results showed improvements in health parameters, such as lipid profiles and weight controls.¹⁹ Nutrition education can also be delivered via media. According to our report, both SR Nutrition and Judy More Child Nutrition Consultancy running in the United Kingdom focusses on providing nutrition messages and advices via magazines, websites, radio and TV, which are less costly, yet reaching more audience influencing eating habits and psychological factors significantly.²⁰ However, Wilson has demonstrated that messages through media could be a challengeable method, where the design of nutrition messages must be based on persuading strategies to reach specific groups from the community.²¹ Seymour has indicated that media messages influence on health is also dependent on the duration of exposure.²² Writing books and creating learning resources are also considered a great educational strategy,⁷ seen with Judy More Consultancy, where they focus on writing books and providing learning resources for mothers and children, which are excellent resources to be provided, in particular for the high socioeconomic and educated groups.⁷ School based nutrition programs

success is always related to the quality of books and learning resources provided to deliver nutrition lessons to children in school.²³ Electronic materials are also used by the community, where some groups of parents are actually happier in receiving nutrition education through Facebook²⁴ or through other online resources accessed via websites, which is at their convenient timin.²⁵ Furthermore, writing articles about healthy meals and recipes is another strategy seen by Pure Vitality Nutrition Concepts, and one of the founders most popular ones are "20- Minute Healthy Meal Recipes" and "Canadian Thanksgiving." Healthy recipes combined with cooking workshops targeting families and their kids are believed to be strongly effective on children health. In an intervention called "Growing Health Kids", children aged 2 to 5 years old have enrolled in the intervention, showed an improvement in their BMI classification and increased their consumption of fruit and vegetables.²⁶

Costs and expenses of programs that are developed to be run in kindergarten schools are considered major barriers in agreement with our previous market potential analysis, confirmed by parents of high socioeconomic status in Saudi Arabia.⁸ More burden happens, when providing programs to low socioeconomic schools, due to lack of funds by private sectors and/or governments. An intervention carried on 69 low income kindergarten schools showed that students are receiving little nutrition education, physical activity and physical education.²⁷ Fund raising and building collaborations with schools are both considered great approaches for different seriocomic levels. Both Qua Nutrition and Café Nutrition a greater development plan, where they have expanded their services to Dubai including raising high funds and also seen with Café Nutrition. Briggs et al has suggested to include school members to work together with service providers working at nutrition consultancy agencies, to ensure schools approvals of implementing Child Nutrition Programs, which include nutrition education and counseling.²⁸ Other collaborations has been seen with spas seen with Pure Vitality Nutrition Concepts to provide workshops for members of the spa Sofitel in Singapore. Such collaboration may add authenticity, value and satisfaction for spa members receiving great health and wellness services.²⁹

According to our descriptive study on global consulting companies, costs and expenses are major burden to implement programs on the national level. Still convincing schools to joining programs may be difficult where funds are needs for nutritionists fees, learning resources, food preparations, human resource all counts to deliver the program. Unlike when it is provided in partnership with schools members or to be funded by the government as described in table 1. However, including several services and strategies carried by those global companies would make an ideal national program in Saudi Arabia , such as public speaking, participating in media, writing in journals and publishing books, involving caregivers, personalized nutrition and varieties of training workshops. Such services can be carried by health professionals from dietitians and nutritionist to promote health and wellness in schools in different ways.

Conclusion

Our study have reviewed the main governmental nutrition programs carried in the United States and in the United Kingdom and five successful nutrition programs carried by global consulting companies all over the world. It is confirmed according to our review and literature that main services to impact the

targeted groups in schools are school meals, training workshops, one to one coaching and nutrition learning resources in schools. Furthermore, public speaking and informal talks about child nutrition to raise awareness among families and children is also essential. According to our review, the best approach for Saudi Arabia to adapt in the BNF curriculum in the United Kingdom, where almost all schools are members and such organizations provides professionals and learning materials to deliver services relaed to child nutrition programs. A great approach is following the Qua Nutrition strategies, which focus on nutrition education, school provision and teachers/staff/caregivers training, making schools allies with same goals. Our goal is to present this paper to the Ministry of Health and Ministry of Education to create an organization from scratch to collaborate with schools in providing variety of services to reduce childhood obesity through both schools and home environment, via health professionals.³⁰

Acknowledgements

I would like to express my sincere gratitude to Mr Hussam Almarzouki and Ms Lujain Alnahdi from UCG United Consulting Group for their participation and support

References

1. Seidell JC, Halberstadt J. (2015) The Global Burden of Obesity and the Challenges of Prevention. *Annals of Nutrition and Metabolism*.66(suppl 2)(Suppl. 2):7-12.
2. Brown LB, A. Thompson, J. and J. Uda. (2012) Increasing College Students' Awareness of Environmental Factors That Influence Nutrition. *Journal of Nutrition Education and Behavior*. (4):S22.
3. Hughner RS, McDonagh, P., Prothero, A., Shultz, C.J., Stanton, J. (2007) Who are organic food consumers? A compilation and review of why people purchase organic food. *Journal of Consumer Behaviour*,.6.(2-3):p. 94-110.
4. Wang D, Stewart D.(2013)The implementation and effectiveness of school-based nutrition promotion programmes using a health-promoting schools approach: a systematic review. *Public Health Nutrition*.16(6):1082-100.
5. Madani KA, Alamoudi NS, Kumosani TA. (2000) The State of Nutrition in Saudi Arabia Nutrition and Health.14(1):17-31.
6. Ministry of Health: Programs 2017 [Available from: (<https://www.moh.gov.sa/en/Ministry/Structure/Pages/Programs.aspx>).
7. Boyle MA. (2016) Community Nutrition in Action. An Entrepreneurial Approach. Edition S, editor.
8. Eid NMS. (Submitted) Child Nutrition Programs in schools: an insight of the need of health promoting programs in Saudi kindergarten schools. *Current Research in Nutrition and Food Science*.
9. USDA United States Department of Agruculture: Food and Nutriton Service: Programs and Services 2018 [Available from: (<https://www.fns.usda.gov/programs-and->

- services).
10. British Nutrition Foundation: Food in Schools 2018 [Available from: (<https://www.nutrition.org.uk/foodinschools.html>).
 11. <https://www.fns.usda.gov/nslp/national-school-lunch-program-nslp>.
 12. National School Lunch Program (NSLP) 2018 [Available from: <https://www.fns.usda.gov/nslp/national-school-lunch-program-nslp>.
 13. Qua Nutrition : Nutrition for kids 2018 [Available from: (http://quanutrition.com/Nutrition_packages/nutrition_kids).
 14. Cafe Nutrition: Nutrition for Children 2018 [Available from: (<http://www.cafenutrition.com/child-nutritionist-nutrition-for-children/>).
 15. SR Nutrition: Child Nutrition 2018 [Available from: (<http://www.srnutrition.co.uk/child-nutrition>).
 16. Child-Nutrition 2018 [Available from: (<https://child-nutrition.co.uk>).
 17. Pure Vitality Nutrition Concepts 2018 [Available from: (<http://purevitalitync.com/services/>).
 18. Koblinsky SA, Guthrie JF, Lynch L. (1992) Evaluation of a nutrition education program for head start parents. *Journal of Nutrition Education*.24(1):4-13.
 19. Sartorelli DS, Sciarra EC, Franco LJ, Cardoso MA. (2005) Beneficial effects of short-term nutritional counselling at the primary health-care level among Brazilian adults. *Public Health Nutrition*.8(7):820-5.
 20. Graziose MM, Downs SM, O'Brien Q, Fanzo J. (2018) Systematic review of the design, implementation and effectiveness of mass media and nutrition education interventions for infant and young child feeding. *Public Health Nutrition*.21(2):273-87.
 21. Wilson BJ. (2007) Designing media messages about health and nutrition: what strategies are most effective? *J Nutr Educ Behav*. 39(2 Suppl):S13-9.
 22. Seymour J. (2018) The Impact of Public Health Awareness Campaigns on the Awareness and Quality of Palliative Care. *Journal of Palliative Medicine*.21(S1).
 23. Perez-Rodrigo C, Aranceta J. (2001) School-based nutrition education: lessons learned and new perspectives. *Public Health Nutr*.4(1a):131-9.
 24. Lohse B. (2013) Facebook is an effective strategy to recruit low-income women to online nutrition education. *J Nutr Educ Behav*. 45(1):69-76.
 25. Bensley RJ, Hovis A, Horton KD, Loyo JJ, Bensley KM, Phillips D, et al. (2014) Accessibility and preferred use of online Web applications among WIC participants with Internet access. *J Nutr Educ Behav*. 46(3 Suppl):S87-92.
 26. Castro DC, Samuels M, Harman AE. (2013) Growing Healthy Kids. *American Journal of Preventive Medicine*. 44(3):S193-S9.
 27. Hammerschmidt P, Tackett W, Golzynski M, Golzynski D. (2011) Barriers to and Facilitators of Healthful Eating and Physical Activity in Low-income Schools. *Journal of Nutrition Education and Behavior*. 43(1):63-8.
 28. Briggs M, Fleischhacker S, Mueller CG. (2010) Position of the American Dietetic Association, School Nutrition Association, and Society for Nutrition Education: comprehensive school nutrition services. *J Nutr Educ Behav*. 42(6):360-71.
 29. Lin IY, Mattila AS. (2018) A conceptual model of co-creating an authentic luxury spa experience. *International Journal of Spa and Wellness*.1-16.
 30. Eid NMS, AlJahdali A, Albajri E, and Naseeb M. (2018) Child Nutritoin , daily meals quality and obesity: SSMHMS Saudi School Meal and Home Meal Study, Submitted. *Journal of Food and Nutrition Research*