

ESTABLISHING NUTRITIONAL INTAKE AND DETERMINANTS OF FOOD CHOICE AMONGST CONSTRUCTION WORKERS IN GAUTENG, SOUTH AFRICA

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Nutrition is known to be linked with worker health and safety (H&S) performance. Literature suggests that construction workers have poor nutrition and this adversely affects their safety performance on construction sites. However, little attention is being given to the nutrition of construction workers in South Africa and indeed Africa, both in research and in practice. This paper presents findings on the nutritional intake of construction workers and the determinants which contribute to the predominant intake amongst construction workers. Empirical data were collected through a field questionnaire survey conducted on site construction workers in the Gauteng Province of South Africa. Participants were selected using heterogeneity and convenience sampling techniques. Data were analyzed using Statistical Package for the Social Sciences, version 22 software. Mean values and standard deviation were computed. The rank of the foods and determinants was established. Findings revealed that construction workers' nutrition consisted mainly of meat and corn meal. Other frequently consumed food items were found to be fruits and vegetables. The study also found that nutritional knowledge, as well as economic and physiological factors were significant determinants of food choices and intake amongst construction workers. The study will increase awareness about the contribution of nutrition in H&S performance improvement. In addition, design of explicit nutrition intervention programmes will be guided, taking cognizance of the determinants of construction workers' food choices. By highlighting the nutritional intake of construction workers and the determinants of their food choices, relevant and effectual intervention programmes can be designed for nutrition improvement and in turn, construction health and safety performance improvement. In addition, nutrition will be given more attention in health and safety considerations on construction sites.

Keywords: construction workers, food choice determinants, nutrition, safety performance, South Africa

INTRODUCTION

Workers' nutrition has been a source of concern to researchers and organizations. According to the World Health Organization (WHO) 2015), national productivity can be increased by 20% if workers are adequately nourished. Adequate nourishment can be attained through consumption of a variety of foods from different food groups including proteins, carbohydrates, vitamins and minerals in moderation and balance (Amareet al. 2012). Over-consumption or under-consumption of nutrients can lead to the development of chronic diseases such as diabetes, heart disease, etc., obesity and nutrient deficiencies, leading to increased susceptibility to infections, fatigue, dizziness, confusion, and lack of concentration which may result in accidents, injuries and even death (Du Plessis 2011; Okoro et al. 2014). Therefore, poor nutrition results in poor health which in turn results in reduced physical and mental capacity, increased risks and rates of accidents, incidents and injuries, reduced efficiency and productivity, increased costs incurred in treating avoidable illnesses and diseases, lost working days, losses in profits, and ultimately reduced Gross Domestic Product (Okoro et al. 2014).

Construction workers have poor nutrition and this affects their health, safety and productivity (Groenveld et al. 2011; Tiwary et al. 2012; Okoro et al. 2014). Despite the undeniable role of

nutrition in health, safety and productivity improvement on construction sites, it appears that there is a dearth of literature focusing on the nutrition of construction workers in South Africa and indeed Africa. Research on construction workers' nutrition is overriding since they are the human capital in the industry and therefore indispensable. Moreover, construction activities are labour-intensive, and physically and mentally demanding, requiring moderate to maximum levels of physical strength and stamina, manual dexterity and coordination as well as mental concentration and alertness (Construction Labour Contractors (CLC) 2014). Construction is a high-risk and hazardous sector. Hence, construction workers cannot perform certain construction activities while fatigued or suffering from ill-health. Their nutrition therefore requires considerable attention. Improving nutrition requires an understanding of the determinants of food choice among the subject population (European Food Information Council (EUFIC) 2005).

Research has been conducted on the factors which influence construction workers' nutrition (Du Plessis 2011 & 2012; Okoro et al. 2014). Previous studies have either incorporated workers in general (Watkins et al. 2008); focused on particular factors such as socio-cultural factors (Puoane et al. 2006) and environmental factors (Watkins et al. 2008); focused on construction apprentices only (Du Plessis 2012); or presented a literature review of the factors (Du Plessis 2011; Okoro et al. 2014). The present paper investigates nutritional intake and determinants of construction workers' food choice and intake. Knowledge of these factors will help in focusing interventions for nutrition to the specific determinants to avoid expenditure on irrelevant and ineffectual intervention programmes. Improving the nutrition of construction workers will in turn contribute to improvement in productivity and H&S in the construction industry. The objectives of the present paper are therefore to establish the predominant nutritional intake and the determinants of food choice and intake amongst construction workers in the Gauteng Province of South Africa.

LITERATURE REVIEW

Workers' nutritional intake

Extant literature revealed that poor nutrition exists amongst workers in most sectors of economies. According to Hurst et al. (2007), agricultural workers, like construction workers, have predominantly poor nutrition due to their socio-economically backward status and generally low level of nutritional knowledge. The plight of the agricultural workers is complicated by the informality of employment and seasonal nature of work which further complicates efforts to establish collective bargaining agreements in terms of provision of welfare facilities such as catering facilities, and food (Hurst et al. *ibid.*). A similar study by Dabhadker et al. (2013) indicated that coal mine workers in India had poor nutritional status and as a result, their work efficiency was affected. Dabhadker et al. (*ibid.*) used nutrient intake counts and anthropometric measurements of height and weight to determine nutritional adequacy. Similar studies also reported that transit and manufacturing workers have unhealthy diets with high rates of fast-food consumption and these food choices are mostly determined by their social environment (French et al. 2007; Inoue et al. 2014).

In the construction industry, Tiwary et al. (2012) revealed that construction workers in India were bread-winners to large families and were poorly paid and this led to regular, but sometimes inadequate, consumption of staple foods including rice, beans and potatoes.

According to the authors, meat consumption was rare amongst these workers because they could not afford it. In a similar study, it was found that male construction workers in Australia, especially younger ones, had poor nutrition (Du Plessis 2011). This study focused on young apprentices in the construction industry. Older construction workers in South Africa were also reported to have a lifetime of inadequate nutrition (English and Bowen 2011).

The above literature evinces that the problem of nutrition might not be peculiar to the construction industry. The situation also seems to exist in informal sectors of the economy which are fraught with difficult circumstances associated with poor working conditions and low income. Unsurprisingly, the EUFIC (2005) noted that low-income groups have a tendency to eat unhealthily. However, eating behavior is not a constant phenomenon, but will change with differing circumstances and experiences of an individual (Arganini et al. 2012). Therefore, improving construction workers' nutrition, in particular, requires an understanding of the factors which are peculiar to their circumstances.

Measuring nutritional intake

Various food intake methodologies have been used to determine nutritional intake, for instance, 24-hr dietary recalls, food frequency questionnaires, anthropometric measures and measurement with bio-markers (Sultana et al. 2014). Which method one decides to use depends on the questions to be probed, the settings, the participants and the outcomes required (Huang et al. 2011). Amare et al. (2012) designed and validated a FFQ to obtain quantitative information about the usual food consumption patterns with the aim of assessing the frequency with which certain food items or groups (including meat, fish, eggs, fat-rich foods, dairy products, fruits, vegetables, etc.) were consumed during/over a period of time.

Determinants of Food Choice and Intake

According to Arganini et al. (2012), the choices people make about food determine which nutrients enter their body and these choices are influenced by many interrelating factors. The determinants were identified as nutritional knowledge, as well as economic, environmental, social, psychological and physiological factors.

Knowledge about nutrition and its associated health benefits and requirements with regard to age and body size, determine nutritional intake (Arganini et al. 2012). According to Grunert et al. (2010), nutritional knowledge is indicated by ability to identify healthiest foods from various sources or knowledge of what a healthy diet means; knowledge of the sources of nutrients; and knowledge of the health implications of eating or failing to eat particular foods. Food preparation and cooking skills also influence food choices and eating behaviours (Chenhall 2010).

With regard to economic determinants, research indicated that wages/income (Tiwary et al. 2012), cost and availability of food (Du Plessis 2012), marketing strategies of food vendors and companies (Kushi et al. 2006), brand names and food variety (Berger et al. 2007) influence food choices and intake.

Environmental determinants include the physical environment and features at a workplace (Ball et al. 2006). Welfare facilities for washing up before eating, storing and heating up food, and eating areas are physical features which are limited or non-existent on construction

sites (Food and Agriculture Organization (FAO) n. d.) Thus, foods get contaminated from the dirty worksites, leading to ill-health. Eating locations (Stroebele & De Castro 2004), seasonality and time constraints (Kolbe-Alexander et al. 2008) also influence food choices.

What people eat is also formed and constrained by circumstances that are essentially social including peer pressure or co-workers (Du Plessis 2011), family needs, social values attached to food and a need to belong or gain socio-economic standing in the community (Puoane et al. (2006).

Psychological factors such as beliefs, attitudes (which usually stem from unfamiliarity of foods or their effects on health), habits, perceptions, motives (for example, to be thin or lose weight) and personality were reported to influence food intake (Babiczy-Zielinska 2006). Dindyal and Dindyal (2003) argued that some cultures and traditions may encourage or frown upon consumption of certain foods by individuals who belong to their groups, leading to restrictions such as exclusion of meat and milk from the diet.

With regard to physiological determinants, hunger, taste, appetite, genetic predispositions and personality traits play important roles in determining food choice and dietary behaviour (Delaney and McCarthy 2009). Satiety, taste and appetite also significantly influence consumption of fast-foods, especially amongst younger adults and the less educated (Marreiros & Ness 2009; Blanck et al. 2009).

These determinants relate to general industry and affect workers in varying degrees simultaneously or independently. For construction workers, the effects or impact may be more given the complexities surrounding their working conditions (for instance, low wages and non-provision of welfare facilities), which appear to be peculiar to the industry.

METHODS

A 5-point likert-scale survey questionnaire was constructed from an extensive literature review of workers' nutrition and determinants of nutrition. The questionnaire consisted of two sections; the first section (14 items) enquiring about the frequency of consumption of a list of food items in a working week (adapted from Amare et al. 2012) and the second section (42 items) related to nutrition determinants. The questionnaire was pilot-tested, reviewed and revised by the researcher's supervisor, co-supervisor and statistician. The final questionnaire was self-administered to construction workers on eight construction sites (five building construction and three civil engineering sites). Participants included craft workers (comprising brick layers, electricians, carpenters, steel-fixers, plumbers, pavers, cleaners, tillers, manhole specialists, painters and glass-fitters) who were actively engaged in the physical construction activities and who are more susceptible to poor nutrition and safety on sites, as opposed to the site managers and supervisors. Heterogeneity sampling was used to select sites because the concern was not about representing the views proportionately, but about including all the views (Trochim 2006). Attention was paid to including workers from different organizations in order to obtain a representative population. On site, participants who were present and willing to take part in the study were conveniently chosen based on their relative ease of access (Goyal & Goyal 2012). 180 completed questionnaires were recovered out of a total of 220. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 22 software. Internal consistency was assessed using Cronbach's alpha *a*. The *a* value for the nutritional intake items

was 0.758, while the values for the determinants ranged from 0.705 to 0.837, indicating good internal consistency (Pallant 2013). Outputs were mean (M) and standard deviation (SD) values. Weights were assigned to each response ranging from 1 to 5 for “strongly disagree” to “strongly agree”. The ranking or relative importance of the food items and nutrition determinants were also assessed based on the mean values.

RESULTS AND DISCUSSION

Findings on nutritional intake

Respondents were asked to indicate how often they consumed the listed food items in a working week (Table 1). Corn meal consumption recorded the highest mean (M=4.46) with standard deviation (SD) of 0.888, followed by meat consumption (M=4.01, SD=0.946), then vegetables (M=3.79, SD=0.986) and fruits (M=3.73, SD=0.976). That construction workers’ nutrition consisted mainly of corn meal, meat, vegetables and fruits is inconsistent with the findings from Tiwary et al. (2012) which found that construction workers consumed mostly staple foods like rice and potatoes and little or no meat because they could not afford the latter. A possible explanation for the inconsistency could be that what might be considered “staple” in one geographical area might not be considered as such in another. In South Africa, meat is generally affordable, even by low-income earners like construction workers.

Table 1: Findings on nutritional intake measures

Measures	Responses (%)					Mean	SD	Rank
	Never	Rarely	Sometimes	Often	Always			
Corn meal	2	1	10	22	65	4.46	0.888	1
Meat	2	4	21	38	35	4.01	0.946	2
Vegetables	1	7	34	28	30	3.79	0.986	3
Fruits	0	8	38	26	28	3.73	0.976	4
Eggs	2	8	41	33	16	3.53	0.914	5
Grains like rice	2	7	43	33	15	3.51	0.909	6
Dairy products	3	11	47	26	13	3.35	0.941	7
A lot of fried foods	6	16	46	20	12	3.18	1.029	8
A lot of sugary foods	15	12	40	21	12	3.04	1.190	9
Fish	7	17	51	17	8	3.03	0.971	10
Cereals	8	19	51	15	7	2.95	0.979	11
Pasta	10	22	44	18	6	2.90	1.020	12
Nuts	4	29	48	12	7	2.88	0.921	13
Extra salt	23	26	30	14	7	2.58	1.199	14

Findings on determinants of food choice and intake

Respondents were asked to express their level of agreement to statements about the factors which determine their food choices. The findings presented here show the respondents’ agreement relative to the extent to which the respective factors influence their food choice and intake in terms of mean values ranging between 1.00 and 5.00.

Nutritional knowledge

Table 2 shows that knowledge about sources of energy (M=3.91, SD=0.698), knowledge about the sources of nutrients (M=3.76, SD=0.841) and knowledge about nutritional requirements for the type of work engaged in (M=3.68, SD=0.862) were reported to be the most influential in this category. Most of the recorded SDs were less than 1.0, indicating similar opinions among

the respondents. These findings support Grunert et al.'s findings (2010) which found that knowledge about various sources of nutrients or what constitutes a healthy diet and knowledge of the health benefits of eating or avoiding particular foods essentially determine food choices.

Table 2: Findings on nutritional knowledge

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Knowledge of sources of energy	1	4	10	72	13	3.91	.698	1
Knowledge of sources of different nutrients	2	6	20	59	14	3.76	.841	2
Knowledge of requirements for type of work	3	6	21	60	10	3.68	.862	3
Knowledge of requirements for an adult	2	9	25	54	10	3.60	.870	4
Knowledge of health consequences of eating or not eating particular foods	5	8	25	50	13	3.58	.975	5
Knowledge of requirements for current health status	2	10	34	39	14	3.53	.937	6
Knowledge of requirements for my age	3	8	42	38	10	3.43	.872	7
Knowledge of requirements for my body size	4	12	42	29	14	3.38	.983	8
Knowledge of what I should eat as a man or woman	10	18	34	34	5	3.06	1.054	9
Cooking skills	10	19	35	30	7	3.04	1.074	10

Economic determinants

Table 3 evinces that cost (M=3.92, SD=0.946), availability of food (M=3.91, SD=0.903) and wages (M=3.73, SD=1.152) are most influential among economic factors. The SD values recorded for cost and availability of foods (0.946 and 0.903, respectively) seemed to suggest that they were equally deemed to be influential determinants. The findings that cost and availability determine food choices align with findings from Du Plessis (2012) which indicated that these factors chiefly influenced food choices among construction apprentices in Australia.

Table 3: Findings on economic determinants

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Cost/price of food	2	6	15	49	28	3.92	.946	1
Availability of food	1	7	18	49	26	3.91	.903	2
Wages/income	8	9	10	49	24	3.73	1.152	3
Discounts/subsidies	5	15	17	48	16	3.55	1.067	4
Brand name	10	22	33	27	10	3.05	1.122	5
Advertising/marketing	9	26	35	23	7	2.92	1.068	6

Environmental determinants

Table 4 shows that time (M=3.23, SD=1.073) and seasonality (M=3.18, SD= 0.984) recorded the highest mean scores, while facilities provided for eating (M=3.09, SD= 1.172) recorded the lowest. The recorded SD for foods in season seemed to suggest that the respondents' views

about seasonality being a nutrition determinant were similar, while their views were relatively more varied with respect to on-site facilities for food storage and eating. These findings align with findings from Stroebele & De Castro (2004) and Kolbe-Alexander et al. (2008) which identified location, time and seasonality as significant food choice determinants.

Table 4: Findings on environmental determinants

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Time	6	21	27	36	10	3.23	1.073	1
Foods in season	5	18	41	28	9	3.18	.984	2
Location	5	23	32	34	7	3.16	1.011	3
Facilities for storing and heating up food	9	21	31	28	12	3.15	1.137	4
Eating facilities on site	11	19	31	28	11	3.09	1.172	5

Social determinants

From Table 5, it can be seen that family norms and traditions (M=3.51, SD=1.023) were found to be the most influential social determinants as perceived by the sample workers. This result is consistent with Puoane et al.'s (2006) findings which reported that individuals make food choices based on their family orientation and values attached to food.

Table 5: Findings on social determinants

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Family norms and traditions	4	15	19	49	12	3.51	1.023	1
Social belonging	10	33	19	27	11	2.95	1.196	2
Peer/colleagues' influence	12	31	22	29	6	2.86	1.141	3
Social media and networking	13	35	30	17	6	2.67	1.078	4

Psychological determinants

From Table 6, it can be seen that the fact that healthy food will help increase productivity at work (M=3.88, SD=0.781) and help to improve concentration and avoid injuries (M=3.68, SD=0.945) recorded the highest mean scores. It is also notable that beliefs regarding consumption of meat seemed not to be significant determinants of food choices amongst the respondents. This does not align with findings from Dindyal and Dindyal (2003) which revealed that individuals may choose to exclude meat based on certain beliefs and restrictions.

Physiological determinants

Table 7 shows that there is concurrence amongst the respondents regarding the physiological determinants as being influential on their food choice decisions as evinced by the recorded mean scores. The recorded SD values (less than 1.0) suggest that the respondents viewed all the factors as being equally influential. These findings concur with findings from Du Plessis (2011) which indicated that appetite, satiety, and taste influence choice of food.

Table 6: Findings on psychological determinants

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Fact that healthy food helps to increase my productivity	2	4	11	69	14	3.88	.781	1
Fact that healthy food helps me to concentrate and avoid injuries	4	8	17	58	13	3.68	.945	2
My idea that particular foods make me lose or add weight	7	12	28	43	11	3.41	1.046	3
Mood eg. happy, sad, etc.	9	17	37	31	7	3.10	1.053	4
Cynical attitude about nutrition promotions	8	21	35	24	11	3.10	1.112	4
Eating habits	14	20	25	32	9	3.02	1.200	6
Belief that current diet is adequate	17	27	16	33	7	2.86	1.247	7
Belief of eating food from my culture	15	36	18	22	9	2.74	1.218	8
Belief that avoiding meat saves money	30	38	8	21	3	2.29	1.189	9
Belief that avoiding meat keeps me healthier	33	35	12	14	7	2.27	1.242	10
Belief that killing animals for food is not good	34	38	9	12	7	2.21	1.232	11

Table 7: Findings on physiological determinants

Measures	Responses (%)					Mean	SD	Rank
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree			
Hunger	4	2	10	59	26	4.02	.865	1
Appetite	2	2	18	59	19	3.91	.806	2
Satiety	4	4	12	63	17	3.87	.872	3
Taste	4	4	16	57	19	3.81	.929	4
Quality of food	2	4	21	58	15	3.79	.832	5
Appearance of food	4	9	24	49	15	3.64	.965	6

CONCLUSION

The study set out to establish the predominant nutritional intake and the determinants of food choice among construction workers in Gauteng, South Africa. Findings revealed that the nutrition of construction workers consists mainly of meat and corn meal. It was also found that nutritional knowledge, economic factors (including cost, availability of healthy food alternatives, wages and food discounts/subsidies) and physiological factors (including hunger, appetite, satiety, taste and quality of food) were the most influential food choice determinants.

With these findings, nutrition intervention programmes can focus on the identified significant factors. Nutrition education could be intensified to encourage construction workers to make more varied food choices. The importance of healthy eating on their H&S should continuously be emphasized. In addition, supplementary feeding programmes can be organized to support construction workers' nutrition given their plight regarding the low wages they earn.

Employers could collaborate with organizations to provide varied foods on site. Healthy and

varied food alternatives could be provided in vending machines, and discounted to encourage purchase of such foods.

The study provides useful evidence to develop measures to improve construction workers' nutrition, which will in turn help in maintaining their physical and mental health and prevent occurrence of accidents, injuries and/or deaths on construction sites. Hence, productivity will be increased, expenditure on avoidable on-site exigencies will be decreased and Gross Domestic Product will be increased.

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