

Determinants of nutrition practice and food choice in UK construction workers

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Summary

The workplace is considered an effective setting for health and wellbeing interventions, including programmes focusing on nutrition, and provides opportunities to tailor programmes to meet the specific needs of industry and employees. This study explored nutrition practices amongst construction workers and managers to inform the design of a nutrition intervention. Five focus groups were conducted on three construction sites: two with managers ($n = 11$) and three with workers ($n = 27$). Construction workers and managers identified several unhealthy nutrition-related behaviours, including high consumption of convenient and fast foods, excessive coffee, alcohol, energy drinks and low fruit and vegetable intake. These behaviours were often attributed to high workloads, long working hours and physically demanding jobs. Snacking and skipping meals were repeatedly reported, attributed to short breaks and poor accessibility to food outlets. The nutritional quality of meals differed between individuals (homemade vs fast food), depending on the type of sites (temporary vs permanent) and site location. Nutrition knowledge, establishing routines, meal planning and preparation were recognized as important in sustaining healthy nutrition habits. However, meal preparation depended on the facilities available, which differed between managers and workers, highlighting the complex relationship between the workplace context and eating behaviours. Construction workers were interested in learning about nutrition and improving their eating habits through nutrition intervention. However, they highlighted that better cooking and storage facilities on site, together with fewer job demands and longer break times, would enhance the sustainability of the intervention and their ability to make healthier food choices.

Keywords: nutrition, workplace health, construction workers, health behaviour, diet

INTRODUCTION

Protecting and promoting the health, safety and wellbeing of workers, by improving the working environment and undertaking health promotion initiatives, has been recognized as a priority by the European Agency for Safety and Health at Work (European Agency for Safety and Health at Work, 2020) and the World Health Organization (World Health Organization, 1994). In the UK, a recent Chartered Institute of Personnel and Development report (2020) highlighted that more organizations are taking a strategic approach to improve the health and wellbeing (H&W) of employees (44% vs 40% in 2019). However, the emphasis is on helping employees who have become ill, rather than on prevention, with 41% of respondents ($n = 1018$) reporting more reactive than proactive organizational practices.

The workplace has been identified as an effective setting for H&W interventions, including nutrition

programmes (Hutchinson and Wilson, 2012; Meng *et al.*, 2017), because it influences health and health behaviours, such as food choices, through providing or limiting access to facilities (e.g. canteens or vending machines), influencing health risks (e.g. through stressful jobs, long working hours), health attitudes (e.g. health supporting culture) and providing health promotion opportunities (e.g. health checks) (Quintiliani *et al.*, 2010; Bonnell *et al.*, 2017). Moreover, it has the potential to eliminate barriers to participation, including a need for transportation and conflicting family responsibilities (Brown *et al.*, 2018). However, given the likely role of the workplace in determining the H&W of individuals, workplace H&W programmes should be designed for specific jobs, industries (Quintiliani *et al.*, 2008; Carmichael *et al.*, 2014) and countries, due to distinctive cultural, business and policy environments (Carmichael *et al.*, 2014).

Working patterns and employment structures differ by country, for example, the Organisation for Economic Co-operation and Development ([Organisation for Economic Co-operation and Development, 2019](#)) found that the highest average number of annual hours worked per worker are in Mexico (2137), with the lowest in Denmark (1380), Norway (1384) and Germany (1386) and the UK estimated at 1538. This equates to a European weekly average of 41.2 hr (full-time equivalent) compared to 42.5 hr in the UK ([Eurostat, 2020](#)). Countries also vary in employment structures, for example, in the UK there are approximately 13.5% self-employed persons ($n = 4\,375\,000$), compared to 86% employed ([Office for National Statistics \(ONS\), 2021](#)), while proportions are almost equal in Latin American countries (e.g. Honduras—52% employed and 48% self-employed) ([Aleksynska et al., 2019](#)).

Globally, construction is a leading industry, accounting for more than 10% of Gross Domestic Product (GDP), employing around 7% of the workforce (approx. 273m+ people) ([Sertyeşilişik, 2016](#)), and was estimated to be worth \$10.8 trillion in 2017 ([Meisels, 2020](#)). In the EU, the sector provides 18 million direct jobs and contributes approximately 9% of the EU's GDP ([European Commission, 2020](#)). In the UK, it accounted for 6% of total economic output in 2017 ([Rhodes, 2018](#)) and 7% of the workforce in 2019 (Health and Safety Executive (HSE), 2020).

Construction workers are often referred to as 'blue-collar workers' and defined by their physical labour component ([Lips-Wiersma et al., 2016](#)), typically in low-ranked positions ([Lucas and Buzzanel, 2004](#)) and paid by the hour or by piece rate based on the amount of work completed ([Wilkie, 2019](#)). Workers in UK construction have been found to experience a high number of work-related injuries and occupational health problems ([HSE, 2020](#); [ONS, 2019](#)). Annually, around 81 000 construction workers suffer from work-related ill health: 57% musculoskeletal disorders, 26% mental health issues, followed by lung disorders and cancers ([HSE, 2020](#)). Furthermore, stress and anxiety due to working in high pressured and dangerous environments are common health consequences ([HSE, 2020](#)), with a survey ($n = 3400$) showing that 25% were considering leaving the industry in the next 12 months for this reason ([Randstand, 2017](#)).

Workplace injuries and ill health have serious effects on individual workers, their families, employers, government and the wider society, with the impact expressed as financial (lost input and healthcare) and non-financial, 'human' costs (the quality of life or loss of life) ([HSE, 2020](#)). HSE ([HSE, 2020](#)) estimated the total costs of workplace self-reported injuries and ill health in 2018/19 to be £16.2 billion. Over half the total cost (£9.56 billion) fell on individuals, whilst the

remainder was shared between employers (£3.16 billion) and government/taxpayer (£3.50 billion). Human costs accounted for almost all the individual costs (£9.3 billion) arising primarily from loss of employment income ([HSE, 2020a](#)). In UK construction, the economic cost of workplace injury and new cases of work-related ill health were estimated at £1062 million in 2016/17, accounting for 7% of the total cost across all industries ([HSE, 2018](#)). However, the above calculations focus solely on financial ill-health costs, ignoring the impact of difficult issues to quantify (e.g. wellbeing, happiness, life experience, conditions with a long latency, itinerant workforce, high self-employment rates, masculine cultures and the stigma around ill-health), and undoubtedly leading to an underestimate of the real costs ([Randstand, 2017](#); [Gibb et al., 2018](#)).

Overweight and obesity are one of the long latency conditions of concern among construction workers ([HSE, 2016](#)). This is associated with cardiovascular problems, increased levels of diabetes and musculoskeletal disorders, as well as implications for safety at work, as obese workers are more likely to encounter difficulties when using equipment and doing strenuous activity ([HSE, 2016](#)). The magnitude of the problem was highlighted during the Olympic Village build, whereby a health check identified that 29% of site workers had hypertension, 40% were overweight and 28% were obese ([Tyers and Hicks, 2012](#)). A range of factors are associated with obesity, e.g. sedentary lifestyles, poor sleep and the high consumption of energy-dense and processed food ([Hruby and Hu, 2015](#)), alongside environmental factors (e.g. increased availability, accessibility, affordability and marketing of energy-dense food) ([Hobbs and Radley, 2020](#)). Whilst sedentary behaviour is less likely to be a contributory factor for construction workers, environmental factors that 'undermine the self-regulatory capacity that people have to make responsible decisions about personal diet and physical activity' ([Hobbs and McKenna, 2019](#), cited in *ibid*, p. 1) are plausible reasons for weight gain amongst this population.

Undesired, unhealthy behaviours in construction include alcohol and drug consumption, smoking (50+ cigarettes a day) and gambling ([Oswald and Turner, 2017](#); [Sherratt and Turner, 2018](#)), with some being attributed to low socioeconomic status and low education level ([Lingard and Turner, 2015](#)), and the latter also associated with obesity ([Cohen et al., 2013](#); [Queiroz Bortolozo et al., 2016](#)). In addition, construction workers have little knowledge of nutrition and consume energy-dense foods in the belief that this will enable them to undertake physically-demanding jobs ([Men's Health Forum \(MHF\), 2009](#); [Viester et al., 2012](#)).

Blue collar workers' food habits are influenced by their colleagues; they can be peer pressured to make unhealthy choices (e.g. meals consumed communally are based on a majority decision) or supported in healthy behaviours, like taking up exercise or eating healthily (Bonnell *et al.*, 2017; Mazzola *et al.*, 2017). Workers also socialize around food, however, this creates divisions as the same occupational groups eat together, often in lunch settings determined by their status (Wandel and Roos, 2005; Naweed *et al.*, 2017).

Job demands affect workers' food choices, with intensive workloads, inflexible schedules, long working hours (even 70+ hr), stress and being 'under pressure', all leaving employees feeling that they lack time, energy, motivation to make healthier choices (Mazzola *et al.*, 2017; Naweed *et al.*, 2017) or using food to deal with stress, by either comfort eating, turning to convenient, processed foods or undereating (Nobrega *et al.*, 2016). Too short or infrequent breaks are also common barriers to healthy eating (Nobrega *et al.*, 2016; Nea *et al.*, 2017), with workers struggling to buy or prepare meals or avoiding fluids due to difficulties taking bathroom breaks (Nea *et al.*, 2017).

The workplace environment affects workers' lifestyle, and determines their health behaviours (Demou *et al.*, 2018) with factors such as cost, time to eat and the availability of healthy food exerting an impact on food choices (Thomas *et al.*, 2016). Onsite barriers to healthy eating include a lack of healthy eating options, poor canteen facilities (including insufficient seating, unhygienic surrounds, poor food-making and food-storage facilities) (Mazzola *et al.*, 2017; Nea *et al.*, 2017). Furthermore, food choices are influenced by site location, with limited food outlets available around remote sites (Wandel and Roos, 2005).

Earlier research found that although healthier foods are considered to be expensive by workers (Pridgeon and Whitehead, 2013; Thomas *et al.*, 2016), there is a growing interest in nutrition, and blue collars welcome workplace changes being made to improve their H&W (Eaves *et al.*, 2016; Nea *et al.*, 2017). However, improving health might be more complicated in male-dominated industries, such as construction, as unhealthy behaviours are sometimes adopted to demonstrate masculinity (Wandel and Roos, 2005; Naweed *et al.*, 2017).

STUDY AIM

This study is part of a phased research project, which sought to (i) explore the perceptions of construction workers and managers of current nutrition practices in the workplace, (ii) explore barriers and facilitators to healthy nutrition choices and (iii) design and evaluate an on-site nutrition intervention. This paper focuses on

phases 1 and 2, with the outcome of phase 3 being reported in a future paper.

LITERATURE REVIEW

The literature search was conducted using PubMed, Web of Science, Scopus, Cochrane Library, CINAHL, ProQuest, Science Direct, supported by findings from national reviews (Black, 2008; Carmichael *et al.*, 2014; MHE, 2009; Public Health England (PHE), 2017) and supplemented with statistical information from the National Institute for Health and Care Excellence (NICE), ONS, Eurostat and the HSE. Where relevant, papers referenced by articles included in the review were retrieved, read and included. Search strategy is included in [Supplementary material, Table 1](#).

The literature review explored work-related factors influencing nutrition choices and eating behaviour of 'blue-collar' (including construction) workers, where literature pertaining to this group was included, due to the paucity of literature relating solely to construction workers. An overview of the findings was presented in the introduction to this paper. A full summary of the literature review is included in [Supplementary material, Table 2](#), where findings are mapped against the theoretical framework of this study, the Socio-Ecological Model (SEM).

THEORETICAL FRAMEWORK

The SEM has been widely used in health intervention research (Gale *et al.*, 2013; Smith *et al.*, 2017; Caperon *et al.*, 2019), as alongside individual influences, it considers a variety of environmental factors influencing behaviour (Golden and Earp, 2012). The model highlights how societal (e.g. policies, norms), organizational (e.g. workplace, community), intrapersonal (e.g. social networks) and individual factors (e.g. behaviours, attitudes, beliefs, knowledge) influence nutrition choices, and provides a framework for understanding the dynamic interrelations between an individual and their environment, including the context within which they exist (Stokols, 1996).

METHODS

Internally homogenous focus groups (FGs) were used to explore: (i) stakeholder perceptions of current nutritional practices and (ii) barriers and facilitators of healthy nutrition choices in construction workplaces. Homogenous groups (separate groups for managers and workers) were selected to facilitate more open conversation amongst participants (Morgan, 1997; Gill *et al.*, 2008), ensure similar socio-economic and educational backgrounds, and allow the examination

of differences in perspectives between groups (Morgan, 1997). Managers and workers are important stakeholder groups in relation to the acceptability and feasibility of workplace health interventions (De Cocker et al., 2015). Workers are recipients, therefore, their participation in the exploration stage might positively influence compliance and engagement with the intervention, whilst managers are the decision-makers whose support is essential for the intervention implementation.

FGs were selected firstly because they provide rich and detailed insights into 'real-world problems, perspectives and potential solutions' (Gilson et al., 2011, p. 43). Secondly, they are known to be especially effective for exploring employees' perceptions and experiences if little is known about the topic (Kitzinger, 1995), and finally, dynamic group interaction enables the generation of large amounts of detailed information (Bryman, 2012) in a relatively short period of time (Rabiee, 2004), which was important as data collection took place during the working day.

Guidelines on the optimal size of six to eight participants per FG were followed, including over-recruitment by approximately 20% to avoid the risk of having an unsatisfactory discussion (Gill et al., 2008). The number of FG was determined by the size of organizations and the organizational constraints (e.g. room availability, workload, time allocated). For example, site A was small; of 12 workers, 9 participated in the FG. Site B was large, but due to limited office space and the workload, we were only provided with time to conduct three FGs. Site C had approximately 50 workers, 10 took part in the FG, 7 more expressed an interest but failed to attend. The number of FGs was in line with other studies exploring employees' perceptions as a part of the health intervention development, e.g., Brown et al. (Brown et al., 2015) used three FGs, Muegge et al. (Muegge et al., 2018) used four FGs, while for studies in construction, Peters et al. (Peters et al., 2020) used two FGs and Ross et al. (Ross et al., 2021) used six FGs. An earlier study exploring dietary behaviours in construction used five FGs (du Plessis, 2011).

Although organizational constraints, rather than data saturation, determined the number of FGs, a recent systematic review assessing sample sizes for saturation suggested FG saturation occurred at four to eight groups (Hennink and Kaiser, 2022). Similar findings were previously discussed by Guest et al. (Guest et al., 2016), who concluded that two to three FGs are sufficient to capture 80% of themes and three to six for 90% of themes.

Pre-determined open-ended questions on current nutritional practices in the workplace and barriers and facilitators to eating healthily at work were asked. A priori themes were identified from the literature review,

and questions were developed, in line with the research objectives with two experienced senior workplace health researchers (see Supplementary material for FG Questions).

The study's author was the interviewer, FGs were recorded, with permission, using an encrypted digital recorder, and transcribed verbatim by professional service providers. Participants were anonymized to ensure confidentiality. The field notes, taken immediately after the FG, were read with the transcripts to ensure the context was fully considered (Phillippi and Lauderdale, 2018).

The study was approved by the Research Ethics Committee of the University of Salford (HSR1819-124).

Participants

Five FGs (lasting 40–60 min) were conducted in 2020, on three different construction sites (A, B, C) (in different companies); two with managers ($n = 11$) and three with workers ($n = 27$). Site A was small (12–14 workers), with approximately 85% of the workforce living locally. Site B was a large site (300 workers), with a majority (70%) of the transient workforce. Site C was a medium-sized site (50–100 workers), with over half of the workforce living locally. Further information on the characteristics of sites is available in the [supplementary material \(Table 3\)](#).

Participants were recruited through organizational representatives, including HR, Health and Safety and site managers. Information sheets and invitation letters were e-mailed via the representatives, and participants were advised to contact the researcher directly, or advise their line manager if they wanted to participate. The researcher was available on-site to provide additional information on the FG, including locations and times.

To qualify for inclusion, participants had to be a construction worker, or a manager/supervisor, and happy to share their experiences on nutrition practices and food choices at work. No other inclusion or exclusion criteria were applied. Across three sites, 55 candidates expressed an interest in taking part, 38 were included in the final cohort and 17 failed to attend for various reasons (e.g. work pressure, or having left the job). Participants provided written informed consent for the study. No monetary compensation was offered; however, light refreshments were provided.

Qualitative analysis

FG data were analysed using Framework Analysis (FA); an increasingly popular approach in health research (Smith and Firth, 2011; Gale et al., 2013). FA uses a combined approach to analysis, enabling themes to be developed inductively from the accounts (experiences and views) of research participants and deductively

(the inclusion of a priori themes) from existing literature (Gale *et al.*, 2013).

The analysis consisted of five systematic and visible stages: familiarization, identifying a thematic framework, indexing, charting and mapping and interpretation. This enabled the tracking of decisions, and movement back and forth across the data until a coherent account emerged. Moreover, links between the original data and findings could be maintained, adding to the rigour of the research process and enhancing the validity of the findings (Furber, 2010; Smith and Firth, 2011). Data were coded by multiple coders (MW, MC and AR) to ensure rigour. Microsoft Excel was used to organize data and synthesize it under themes.

RESULTS

A total of 25 themes were identified in the literature of which 21 were common across the FG findings. Additionally, eight new themes emerged, not previously identified in the literature. Themes were organized using the SEM to enable easy comparison between work-related factors influencing nutrition choices found in the literature and FG. A table showing the relationship between the literature review themes and FG findings is available in the [supplementary material \(Table 4\)](#).

Individual factors related to the eating habits of construction workers

Weight problems were frequently mentioned by participants, with one manager highlighting a weight gain of almost five stone over a 15-year period. Another highlighted that whilst he could be successful at losing weight, he could not sustain this. Workers also highlighted the problem of abdominal obesity (even in slim individuals), noting its association with visceral fat responsible for health problems, and highlighting how this increase in 'belly fat' can be a wake-up call to improve their lifestyle and nutrition.

"Some of them [other workers on site] were really skinny, but they had quite high visceral fat, and that was a bit of a wake-up call for them..." (FG4 workers)

Excess alcohol consumption and smoking were identified as common unhealthy behaviours in the three FGs. While the amount of alcohol consumed was unspecified and most consumption was carried out after work, there was a general feeling this was higher than recommended. Quitting smoking raised concerns about weight gain.

"I went from smoking a packet of cigarettes a day to eating a packet of biscuits a day, when I gave up" (FG4 workers)

The importance of sustaining good/high energy levels to aid alertness, concentration and enable workers to carry out physical jobs was emphasized across all FGs. Food and coffee consumption were highlighted as ways of achieving this, although there was debate about the role of high energy/sugary foods compared to protein foods, or slow-releasing carbohydrates, with sugary diets being associated with being 'perpetually tired' and affecting workers' willingness to cook in the evenings.

"But the key thing is, the industry is not like any other. None of my friends work from 7.00 until 6.30, so to keep you working at the rate you need to, personally I feel I need to have food, I need to" (FG2 managers)

Nutrition knowledge was discussed in all FGs, including an interest in learning about food, its impact on the body and mind, as well as participants reporting limited understanding of healthy eating or frequently forgetting about healthy nutrition habits due to job demands. Participants offered suggestions on how to recognize whether food is healthy or not, including: checking portion sizes, sugar and salt content, preservatives and using the traffic light system on food labels. They also reported they considered food 'looking healthy', being 'nutty', avoiding processed foods, eating fresh foods, cooking from scratch, having colourful foods on the plate and eating a variety of foods. Younger workers were usually considered more knowledgeable about nutrition; however, general confusion caused by the media about what is healthy, as well as misleading information on food packaging, was a concern for some.

"There is so much conflicting information about ... sugar is the enemy, then fat's the enemy, then carbs are the enemy" (FG2 managers)

The consumption of convenience foods, including fast food, ready meals, junk food and eating out was repeatedly mentioned by participants due to limited food outlet accessibility, short break times, lack of time to think about food when shopping, convenience in preparation (e.g. microwave heating) and the need to stay satisfied for longer. Storage problems (i.e. a lack of space to keep food) on site were also mentioned by workers from a large site for their reliance on pre-packed, non-perishable foods.

"Straight into the shop, just grab ... you don't tend to think about what you're grabbing off the shelf,

you just think what's easy to cook, what's going to last longer and what's going to fill you up" (FG4 workers)

Most managers and workers reported that they frequently skipped meals. Poor accessibility to food, short breaks, busy schedules or not being hungry were the most common explanations. None of the participants showed awareness about how skipping meals affected their energy and concentration levels.

"Sometimes you don't eat at all. Sometimes you're that busy you don't eat at all so it can be very varied" (FG3 managers)

The habit of snacking was discussed in all FGs, however, differences in the nutritional quality of snacks were noted, with some snacking on fruit and nuts, while others on crisps, chocolates, jam, bagels and biscuits. Snacking was also considered a way to deal with monotony, with some reporting bingeing on snacks like biscuits.

"I might have a biscuit, then lunch I might have a biscuit" (FG4 workers)

Workers in two FGs highlighted the high consumption of energy (six cans or more) and sugary drinks, to sustain energy. This was highlighted as a general problem across UK construction sites, with participants suggesting that workers replace meals with caffeinated drinks to *'to get through the day'*.

"... So you smash an energy drink, I've seen it on other sites, up the river, people don't even have lunch sometimes, they'll just have an energy drink just to get through the day, which, yes, that's suits me but it's just full of sugar, it's absolutely packed" (FG1 workers)

At the same time, low intake of water was highlighted in three FGs (workers only). Participants replaced water with tea and coffee and keeping a bottle of water while on site was mentioned on only one occasion.

"Coffee and tea, never water or juice" (FG5 workers)

Excessive consumption of tea and coffee, described as: *'plenty'*, *'too much'*, *'drinking all the time'*, *'as much as I want'*, was discussed in four FGs. Some workers reported having eight cups of coffee daily, often with large amounts of sugar and milk, to keep energy levels up, especially as these were free of charge, *'generously supplied'* by the company.

"I am happy with coffee. Keeps me awake" (FG1 workers)

A lack of personal resources, motivation, energy or the willpower to prepare food or pursue healthier food choices, due to demanding and stressful jobs, was recognized by participants in four FGs. *'Lazy'* and *'cannot be bothered'* were frequent expressions.

"...for me just being lazy really, I like to eat all the healthy stuff but it does take time to prepare it" (FG3 managers)

Discussions relating to fruit and vegetable intake received mixed responses, with some having frequent consumption, while others did not, despite recognizing their importance. The main barriers to fruit and vegetable consumption were vegetables not providing sustainable energy and having to rely on the food provided in rented accommodation. Workers who lived locally and brought packed lunches from home seemed to struggle less in this respect.

"If you give me a plate of vegetables, I can eat those vegetables all day long and at the end of the day I'm still thinking I'm still hungry" (FG2 managers)

Alongside the living arrangements of workers, the nature of the site (temporary or permanent), location (distance to food outlets) and availability of storage facilities influenced the habit of bringing a packed lunch from home, which often consisted of leftovers from the day before or a meal prepared by a partner.

"Because they've got a big enough fridge to suit everybody here, depending on if people are going home or whatever, people bring stuff" (FG1 workers)

The importance of meal planning and preparation was mentioned in three groups, with some recognizing the significance of planning meals, while others discussed a lack of motivation in staying organized. Although participants appreciated the benefits of advanced meal preparation on their health and nutrition choices (e.g. not relying on convenient fast food), they expressed concern about the time it takes.

"You do fall into the trap of not being able to plan, and then it's catching food on the fly and getting a Burger King on the way up on the M1" (FG2 managers)

Next to meal planning, managers and workers from two construction sites discussed the value of having

healthy nutrition habits and difficulties in changing unhealthy ones. Working on permanent sites, staying on the same site (even for a week), as well as good welfare facilities were recognized as providing additional motivation to maintain a healthy routine. Nonetheless, participants highlighted that their shopping habits were often an automatic process led by the need to buy food quickly, rather than considering its nutritional value.

“I can’t remember the last time I didn’t have this for lunch’. And it becomes a routine, and I guess it’s getting out of that mindset as well” (FG4 workers)

Interpersonal factors related to the eating habits of construction workers

Construction workers in three FGs talked about socializing at meals; eating, cooking together and sharing food (e.g. an ‘around the world’ Friday meal) as a convenient way to organize meals, stay healthy and bring the team together. This was particularly prominent on sites where most workers were not local, hence stayed in temporary accommodation during the week, with some clubbing together to share the burden of shopping and meal preparation.

“We found it beneficial to get a syndicate if you like and then we buy, I’ll go and buy food for the week ...” (FG3 managers)

Nonetheless, occupational and cultural differences in socializing were reported, with workers of the same status and profession or from the same country usually living, eating and spending time together.

Managers from two FGs (on the same site) mentioned the pressure placed on those who use the work kitchens to cook; feeling hassled when occupying facilities for too long, watched and judged, as well as cooking considered by co-workers as an excuse not to work.

“The only issue in that kitchen there, it’s like the main hub for everybody so everyone is in there, so everyone is watching what you’re doing. What you’re trying to cook. You get people trying to dip their fingers in your food and like ‘oh what you doing there?’” (FG3 managers)

The differences between occupational groups (workers and managers) as well as employment status (employees vs sub-contractors) were visible in the facilities provided on the large site, where workers and managers did not share the same welfare space (discussed in three FGs conducted on the large site). Similarly, potentially divisive differences were visible

with regards to the wellbeing and health opportunities, i.e. the Fresh Fruit Monday initiative was not available to sub-contractors, while fitness activities were designed for ‘*the same group of people*’—‘*fitness freaks*’.

“I noticed here, at the main compound, there’s a lot more in terms of food preparation availability” (FG4 workers)

Organizational and community factors related to the eating habits of construction workers

There was consensus across all FGs that it is difficult to have a nutritious meal within a short break (max 30 min), particularly as construction sites are usually in remote locations, therefore, food choices are determined by the proximity of food outlets, rather than food quality. This was especially the case for workers, as managers were more relaxed when taking their breaks and preparing food.

“I have lunch when I have the time for it, a window for it. The lads on site, they don’t have that. Half ten they’re coming for their break and they’ve got half an hour suddenly to try and do all this” (FG2 managers)

A short break and many workers using the same kitchen space further limited food preparation opportunities, even where good facilities are provided.

“If you’ve got thirty blokes going to canteen all wanting to do poached eggs, well you’re only going to get ten of them with a three-minute poached egg, aren’t you, until they have to go out again?” (FG2 managers)

Workers living in temporary accommodation, particularly those lacking food preparation or storage facilities, reported repeatedly eating out, having ready-meals and takeaways, or relying on non-perishable snacks in the evening. One worker even discussed storing his food outside the window or in the car during cold months due to a lack of suitable facilities. Additionally, accommodation might be far from local shops, town centres, etc., limiting the range of foods that could be purchased if the transport is unavailable.

“Where myself and a lot of others suffer is we go back to hotel accommodation where you don’t have cooking facilities. So you’re reliant on meals that are served to you, like at the hotel and stuff” (FG3 managers)

A well-equipped kitchen on site was reported to make food preparation, storage and therefore healthier eating, easier, although the quality and quantity of facilities differed between sites and even cabins on the same site. For example, workers' cabins were equipped with kettles and microwaves, while managers from the same site mentioned toasters, hot plates, ovens, slow cookers, fridges.

"I think the facilities we've got there are like nothing I've ever seen in a workplace before" (FG2 managers)

Furthermore, dirty cabins, the number of workers using the facilities simultaneously and safety factors, e.g. rats, were limiting factors for food preparation, often only allowing the storage of food for immediate consumption.

"Some of the sites, you might have 300 people in a canteen and you might not necessarily want to use some of the stuff that's up for grabs" (FG1 workers)

While managers and workers from three FGs declared cooking food on site, this was influenced by break times, and the variety and number of facilities available; reflected in the nutritional quality of meals prepared, which ranged from fast food meals heated in microwaves, to porridge and omelettes, and even grilling a full chicken. Workers cooking on site were most often those who stayed in temporary accommodation lacking in food preparation facilities.

"Fast food in terms of what we cook out in the kitchen like paninis" (FG3 managers)

High levels of stress, tiredness and long working hours consistently affected eating practices both at work and home, with some feeling '*sick and tired of work*', and even thinking of leaving construction, referred to as '*an industry like no other*'. Additionally, some declared eating fast food for comfort, or skipping meals due to tight deadlines. However, participants from one group recognized that feeling tired was not only due to job demands but also to poor diets.

"In the afternoon, you're not functioning properly and start thinking about leaving" (FG2 managers)

Workers expressed an interest in taking part in health checks (e.g. blood pressure and visceral fat measures) and appreciated opportunities to get feedback on their health status (two workers groups), suggesting that these should be conducted throughout the day to allow flexibility for attendees.

"Health checks. You could go during lunch, you could go after work, you could go before work, and they would do a health check and make sure everything is alright like your blood pressure, visceral fat [...] you're a bit more aware of your health" (FG4 workers)

Societal factors related to the eating habits of construction workers

A long day of physical work left workers with no time, motivation or energy to cook or shop for food, affecting their evening meal, next day food preparation and generally eating behaviours outside of work (mentioned in four groups).

"If you look at most of the guys here, they're doing physical work, by the time they get home they're trying to deal with the family, cook and stuff like that. So by the time you've got to sort out your lunches for tomorrow, you're like, oh I'm going to leave it" (FG5 workers)

The cost of food, particularly foods perceived as healthy, was recognized as prohibitive in three FGs, who reported that healthy food was more expensive, less convenient, with smaller portion sizes. The price of a salad was compared to a 'meal deal' by one worker, who highlighted he would need to spend £100 monthly to eat more healthily.

"... it's so expensive that you can't justify eating a sandwich that's like so tiny and it's probably the healthiest, but it will be like five quid" (FG5 workers)

Positive nutritional behaviours were reported to have happened over the last 10–15 years, including generational changes, with younger workers being more health conscious, practising better nutrition habits and attending gyms (discussed in two FGs). However, H&W practices amongst sites differed, with some companies running a variety of initiatives to '*lead from the front*' and '*leave a legacy*', with other sites '*being not interested*'.

"Maybe a little bit of it will go along to the next projects and hopefully may change the world of construction" (FG1 workers)

DISCUSSION

This is the first study exploring the nutrition practices of UK construction workers and illustrating how

individual (e.g. habits, knowledge, personal resources) and work-related factors, including environment and social connections, shape such practices. Identified factors, organized under the SEM model, were diverse and wide-ranging, demonstrating the complexity of the issue.

The findings from this study are consistent and further expand on the limited body of evidence on nutrition practices amongst construction workers. Workers reported high intakes of processed, high calorie and high sugar foods as previously reported (MHF, 2009) as well as high intakes of caffeinated drinks and low fruit and vegetable consumption, which are new findings of this study. In previous research, workers described the food as a release from work stress, a form of 'escape' (Devine *et al.*, 2009), often leading to the consumption of energy-dense comfort foods (Nobrega *et al.*, 2016). Although in this study, eating to sustain energy to fulfil physically demanding jobs was the primary motivation behind this consumption pattern. A relationship between energy, nutrition and safety at work has previously been established, suggesting that accidents might be at least partly attributed to an unhealthy diet resulting in feeling weak, indisposition or hypoglycaemia (Bates and Schneider, 2008; Meliá and Becerril, 2009). This indicates that, as suggested by a systematic review by Steyn *et al.* (Steyn *et al.*, 2009), a workplace intervention should target the needs of workers and therefore, provide education on the relationship between diet, energy and concentration. It is worth noting that educational approaches, alone or in combination with multi-component interventions or environmental modifications, have previously shown moderate, but consistent effectiveness on dietary behaviour changes in systematic reviews (Ni Mhurchu *et al.*, 2010; Maes *et al.*, 2012; Geaney *et al.*, 2013).

Secondly, work-related factors, including job demands, break times and physical environments impact the nutrition choices of blue-collar workers (Loudoun and Townsend, 2017) by restricting access to food outlets (Mazzola *et al.*, 2017; Nea *et al.*, 2017), provision of insufficient welfare, food preparation and storage facilities (Nobrega *et al.*, 2016; Okoro *et al.*, 2017), limited time and personal resources to buy, prepare or even plan food (Devine *et al.*, 2003; Thomas *et al.*, 2016). Given the vital role of the workplace environment in assisting workers to adopt and lead healthier lifestyles, environmental changes to facilitate healthy diets have been recognized as elements which can supplement education components of interventions (Meng *et al.*, 2017). A systematic review by Allan *et al.* (Allan *et al.*, 2017) highlighted that environmental changes can supplement and provide advantages over individually targeted interventions, as they work via automatic or non-conscious processes. However,

Schliemann and Woodside (Schliemann and Woodside, 2019), in a systematic review of 21 systematic reviews, found that research on environmental changes is often carried out in workplace canteens, therefore, evidence is limited to interventions conducted in bigger organizations. In construction, sites often have limited space, and the majority are temporary, operating only for weeks or months (Oswald and Turner, 2017; Burki, 2018), which restricts the practicality and cost-effectiveness of implementing catering solutions. Although some large sites offer canteens, workers usually stay in one place for a limited time and are not guaranteed to move to a location with similar facilities (Eaves *et al.*, 2016; Sherratt, 2018). Therefore, workers, in the interest of their health, need to be offered interventions focusing on their capabilities and motivation to make healthier food choices regardless of environmental constraints. Additionally, simply providing more nutritious foods might be insufficient in facilitating behaviour change, as the point of choice does not influence the food choice on its own but must be preceded by an intention to change (e.g. behaviour change and educational activities) (Almeida *et al.*, 2014; Thomas *et al.*, 2016).

Our study shows that amongst the construction workforce, there is a growing interest in health (Eaves *et al.*, 2016; Nea *et al.*, 2017) and in receiving feedback and advice from health professionals. Workers were also found to be motivated to learn how to plan meals and establish healthy habits and routines, which should encourage employers to invest in health initiatives on sites. However, to support the engagement, improve the effectiveness and ensure that interventions are not a lost opportunity, those responsible for the intervention design need to consider the convenience of locations and flexible modes of delivery (Brown *et al.*, 2018; Demou *et al.*, 2018), to enable the intervention to be accessed by all workers (including sub-contractors, part-time workers). In addition, interventions should be mindful of social connections, as food choices are often made to gain and solidify social identity (Mazzola *et al.*, 2017), and individuals can be peer-pressured into healthy or unhealthy behaviours (Okoro *et al.*, 2017). While multiple studies (Kilpatrick *et al.*, 2017; Smith *et al.*, 2017; Payne *et al.*, 2018), including a systematic review of Demou *et al.* (Demou *et al.*, 2018), found the importance of using peer support and group-based activities in workplace health interventions. In construction, this approach could provide support in integrating workers and managers working on site, and reduce, ethnic and occupational groups divisions (found in this study), with the latter also previously reported in the literature (Wandel and Roos, 2005; Naweed *et al.*, 2017). In addition, sharing experiences, colleagues motivating each other, the introduction of

champions and a 'no judgment' approach (especially in 'macho cultures') have been found to lead to higher engagement and better intervention results (Kilpatrick *et al.*, 2017; Demou *et al.*, 2018). The 'no judgment' approach is an interesting finding, in light of previously mentioned peer pressure and the results of this study. Our findings showed that some workers felt hassled and judged when using kitchen facilities and pressured to consume sweet and unhealthy foods, highlighting the importance of addressing the organizational culture to improve the health of workers.

Finally, this is the first study that has explored nutrition practices amongst construction workers and managers, enabling differences between the two groups to be identified. These included an interest in on-site health checks expressed by workers rather than managers. This may well be because employment conditions for managers usually include employee assistance programmes, health insurance and occupational health services, while workers are frequently self-employed (41% of the construction workforce (HSE 2018)), with limited access to occupational health services (Stocks *et al.*, 2011; Burki, 2018). Occupational divisions were found to go beyond lunch eating practices and included distinct wellbeing initiatives offered to different groups on site, with differences in the variety and state of facilities between the cabins of managers and workers, particularly on the large site (a finding not been previously reported in the literature). Lastly, some of the comments made by managers were related to the eating practices of workers, showing that they are aware of struggles, barriers and poor eating practices amongst the workforce.

Although this study is based on UK construction workers, it is internationally relevant, adding to the small evidence base focusing on understanding nutrition practices amongst blue-collar workers. This is of particular importance given: the paucity of studies conducted amongst workers from this group, highlighted in a recent systematic review (Van De Ven *et al.*, 2020); the research gap in respect of effective interventions targeting low socioeconomic workforce (Robroek *et al.*, 2021); and the high ill-health and injury costs associated with the industry. Our findings provide important insights into what should be considered when designing effective nutrition interventions to improve the H&W, particularly for construction workers in low socioeconomic positions.

STRENGTHS AND LIMITATIONS

One strength of this study is that participants included both managers and workers from three different construction sites and three different organizations. In addition, workers taking part in the study were both

employed by the main organization running the construction sites as well as sub-contractors, allowing the exploration of a range of views.

Limitations of this study include risks associated with voluntary response bias, with participants who volunteered to take part in the FG potentially having more interest in health and nutrition compared with the other employee. Also, organizational constraints, rather than data saturation, determined the number of focus groups, which is a limitation. Furthermore, although encouraged by the moderator, not all participants contributed equally to all FGs, potentially due to language barriers, or feeling shy. A longer intervention time could have permitted the research team to conduct individual interviews in addition to FG, or collect observational data on the actual nutrition practices in the workplace to supplement self-reported habits related by participants in the FG. This was not possible due to the Covid-19 restrictions announced in March 2020, temporarily closing construction sites in the UK.

Supplementary Material

Supplementary material is available at *Health Promotion International* online.

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Ethical Approval

The study was approved by the Research Ethics Committee of the University of Salford (HSR1819-124).

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